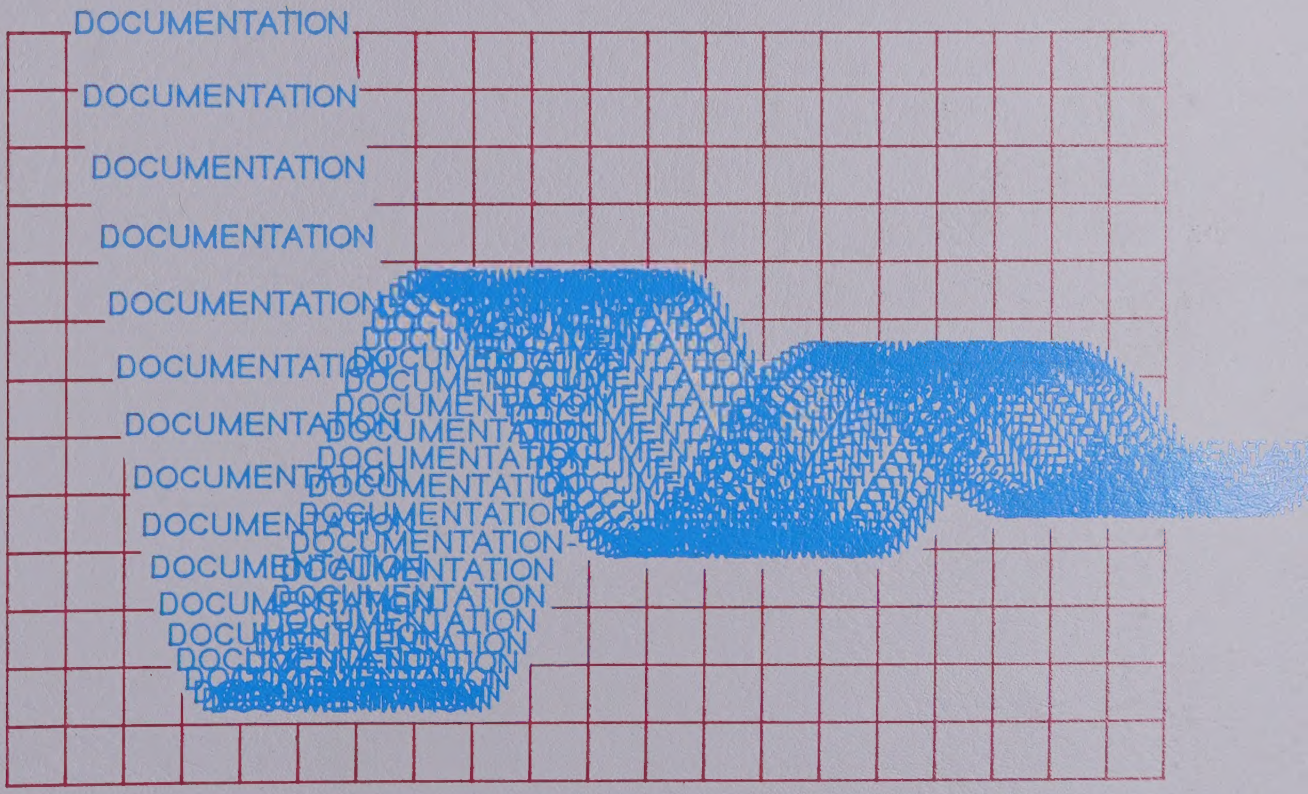
ROHDE & SCHWARZ

DOCUMENTATION
DOCUMENTATION
DOCUMENTATION
DOCUMENTATION
DOCUMENTATION
DOCUMENTATION
DOCUMENTATION
DOCUMENTATION



ROHDE&SCHWARZ

Test and Measurement
Division

Operating Manual

Software Option:
AMPS-MS for CMU-B21

CMU-K29

1115.6807.02

Printed in the Federal
Republic of Germany

Tabbed Divider Overview

List of Figures and Tables

Certificate of Quality
List of R&S Representatives

Contents of Manuals for Universal Radio Communication Tester CMU

Tabbed Divider

1 **Chapter 1: Installation**

2 **Chapter 2: Getting Started**

3 **Chapter 3: Manual Operation**

4 **Chapter 4: Functions and their Application**

5 **Chapter 5: Remote Control – Basics**

6 **Chapter 6: Remote Control – Commands**

10 **Index**

List of Figures

Fig. 4-1 Measurement menu Analyzer / Generator 4.2
Fig. 4-2 Test setup for TX Tests 4.4
Fig. 4-3 Measurement menu TX Tests 4.5
Fig. 4-4 Display of measurement results (TX Tests – Modulation application) 4.8
Fig. 4-5 Power Configuration – Control 4.11
Fig. 4-6 TX Tests Configuration – Limit Lines 4.12
Fig. 4-7 Signal path for TX tests 4.13
Fig. 4-8 Electrical frequency response of the pre-emphasis and a de-emphasis filter 4.14
Fig. 4-9 TX Tests Configuration – Filter 4.14
Fig. 4-10 Measurement menu TX Audio Freq. Response 4.17
Fig. 4-11 Display of measurement results (TX Audio Freq. Response) 4.19
Fig. 4-12 TX Audio Freq. Response Configuration – Control 4.20
Fig. 4-13 TX Audio Freq. Response Configuration Configuration – Limit Lines 4.21
Fig. 4-14 TX Audio Freq. Response Configuration Configuration – Filter 4.22
Fig. 4-15 Test setup for RX Tests 4.24
Fig. 4-16 Measurement menu TX Tests 4.25
Fig. 4-17 Display of measurement results (RX Tests – AF Analyzer application) 4.28
Fig. 4-18 RX Tests Configuration – Control 4.30
Fig. 4-19 RX Tests Configuration – Limit Lines 4.31
Fig. 4-20 Signal path for RX Tests 4.32
Fig. 4-21 Measurement menu RX Audio Freq. Response 4.34
Fig. 4-22 Display of measurement results (RX Audio Freq. Response) 4.35
Fig. 4-23 Connection Control – input and output signals 4.38
Fig. 4-24 Connection Control – RF connectors 4.44
Fig. 4-25 Connection Control – Synchronization 4.46
Fig. 4-26 Group Configuration – Input level 4.48
Fig. 4-27 Signalling states of the CMU 4.51
Fig. 4-28 Connection Control – Signalling (Signal Off) 4.52
Fig. 4-29 Connection Control – Signalling (Signal On) 4.54
Fig. 4-30 Function overview – main menu Overview 4.56
Fig. 4-31 Measurement menu TX Tests 4.58
Fig. 4-32 Measurement menu TX Audio Freq. Response 4.60
Fig. 4-33 Measurement menu RX Tests 4.61
Fig. 4-34 Measurement menu RX Audio Freq. Response 4.62
Fig. 4-35 Connection Control – Signalling (Registered) 4.64
Fig. 4-36 Connection Control – Signalling (Alerting) 4.65
Fig. 4-37 Connection Control – Signalling (Call Established) 4.67
Fig. 4-38 Connection Control – Other call (destination selection) 4.68
Fig. 4-39 Connection Control – Other Call (destination network preparation) 4.69
Fig. 4-40 Connection Control – Handoff (destination selection) 4.70
Fig. 4-41 Connection Control – Handoff (destination network preparation) 4.71
Fig. 4-42 Connection Control – BS Signal (Signal On) 4.73
Fig. 4-43 Connection Control – BS Signal (Call Established) 4.74
Fig. 4-44 Connection Control – Network parameters 4.75
Fig. 4-45 Group Configuration – input level 4.78

Fig. 6-1 Signalling states of the CMU and transitions including Other Call/Handoff 6.79

List of Tables

Table 3-1 Measurement Groups in the *Signalling* and *Non Signalling* Mode 3.4
Table 4-1 AMPS analog voice channels in the reverse path (mobile phone transmit) 4.40
Table 4-2 AMPS analog voice channels in the forward path (base station transmit) 4.42
Table 4-3 AMPS power classes and voice mobile attenuation codes (VMAC) 4.57
Table 5-1 Measurement objects in the *Signalling* and *Non Signalling* mode...................................... 5.2
Table 5-2 Repetition mode in remote control.. 5.3
Table 5-3 Limits and limit check 5.4
Table 5-4 Meaning of the bits used in the `STATus:OPERation:CMU:SUM1|2:CMU<nr>` sub-registers assigned to *AMPS-MS Non Signalling* 5.5
Table 5-5 Meaning of the bits used in the `STATus:OPERation:CMU:SUM1|2:CMU<nr>` sub-registers assigned to *AMPS-MS Signalling* 5.5
Table 6-1 Remote-control commands: Non Signalling 6.94
Table 6-2 Remote-control commands: Signalling mode 6.102
Table 6-3 Remote-control commands: *Non Signalling* mode.. 6.110
Table 6-4 Remote-control commands: *Signalling* mode 6.115

Certified Quality System

ISO 9001

DQS REG. NO 1954-04

Qualitätszertifikat

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde & Schwarz-Qualitätsmanagementsystem ist nach ISO 9001 zertifiziert.

Certificate of quality

Dear Customer,

You have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.

The Rohde & Schwarz quality management system is certified according to ISO 9001.

Certificat de qualité

Cher client,

Vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.

Le système de gestion qualité de Rohde & Schwarz a été homologué conformément à la norme ISO 9001.

ROHDE&SCHWARZ

Support Center

Telefon / Telephone: **(0180) 512 42 42**

Fax: **(++89) 41 29 - 137 77**

e-mail: **CustomerSupport@rsd.rohde-schwarz.com**

Für technische Fragen zu diesem Rohde & Schwarz-Gerät steht Ihnen ab sofort unsere Hotline der Rohde & Schwarz Vertriebs-GmbH, Support Center, zur Verfügung.

Unser Team bespricht mit Ihnen Ihre Fragen und sucht Lösungen für Ihre Probleme.

Die Hotline ist Montag bis Freitag von 8.00 bis 17.00 Uhr besetzt.

Bei Anfragen außerhalb der Geschäftszeiten hinterlassen Sie bitte eine Nachricht oder senden Sie eine Notiz per Fax oder e-mail. Wir setzen uns dann baldmöglichst mit Ihnen in Verbindung.

Should you have any technical questions concerning this Rohde & Schwarz product, please contact the hotline of Rohde & Schwarz Vertriebs-GmbH, Support Center.

Our hotline team will answer your questions and find solutions to your problems.

You can reach the hotline Monday through Friday from 8:00 until 17:00.

If you need assistance outside office hours, please leave a message or send us a fax or e-mail. We will contact you as soon as possible.

ROHDE&SCHWARZ

Adressen/Addresses

FIRMENSITZ/HEADQUARTERS Telefon/Phone
Telefax
E-mail

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstraße 15 · 81671 München +49 89 41 29- 0
Postfach 801469 · 81614 München +49 89 41 29- 12164
Internet: www.rohde-schwarz.com –

WERKE/PLANTS

ROHDE & SCHWARZ Messgerätebau GmbH +49 83 31 10 8-0
Riedbachstraße 58 · 87700 Memmingen +49 83 31 10 81 124
Postfach 16 52 · 87686 Memmingen –

ROHDE & SCHWARZ GmbH & Co. KG
Werk Teisnach +49 99 23 8 57-0
Kaikenrieder Straße 27 · 94244 Teisnach +49 99 23 8 571-1 74
Postfach 11 49 · 94240 Teisnach –

ROHDE & SCHWARZ GmbH & Co. KG · Werk Köln +49 22 03 49-0
Graf-Zeppelin-Straße 18 · 51147 Köln +49 22 03 49-51 3 08
Postfach 98 02 60 · 51130 Köln –

TOCHTERUNTERNEHMEN/SUBSIDIARIES

ROHDE & SCHWARZ Vertriebs-GmbH +49 89 4129-120 07
Mühldorfstraße 15 · 81671 München +49 89 4129-135 67
Postfach 801469 · 81614 München customersupport@rohde-schwarz.com

ROHDE & SCHWARZ International GmbH +49 89 4129-120 05
Mühldorfstraße 15 · 81671 München +49 89 4129-135 97
Postfach 80 14 60 · 81614 München –

ROHDE & SCHWARZ Engineering and Sales GmbH +49 89 4129-137 11
Mühldorfstraße 15 · 81671 München +49 89 4129-137 23
Postfach 80 14 29 · 81614 München –

[illegible] Mobilfunk GmbH +49 50 42 9 98-0
[illegible]feld 7 · 31848 Bad Münder +49 50 42 9 98-105
Postfach 20 62 · 31844 Bad Münder rsbick@rsbick.rohde-schwarz.com

ROHDE & SCHWARZ FTK GmbH +49 30 6 58 91-122
Wendenschloßstraße 168, Haus 28 +49 30 65 550-221
12557 Berlin –

SIT Gesellschaft für Systeme
der Informationstechnik mbH +49 30 6 58 84-2 22
Wendenschloßstraße 168, Haus 28 +49 30 6 58 84-1 83
12557 Berlin sit.info@sit.rohde-schwarz.com

Zweigniederlassungen der Rohde & Schwarz Vertriebs-GmbH/Branch offices of Rohde & Schwarz Vertriebs-GmbH

Zweigniederlassung Berlin (+49 30) 34 79 48-0
Ernst-Reuter-Platz 10 · 10587 Berlin (+49 30) 34 79 48-48
Postfach 100620 · 10566 Berlin customersupport@rohde-schwarz.com

Zweigniederlassung Büro Bonn (+49 2 28) 918 90-0
Josef-Wirmer-Straße 1–3 · 53123 Bonn (+49 2 28) 25 50 87
Postfach 140264 · 53057 Bonn customersupport@rohde-schwarz.com

Zweigniederlassung Hamburg (+49 40) 63 29 00-0
Steilshooper Allee 47 · 22309 Hamburg (+49 40) 630 78 70
Postfach 602240 · 22232 Hamburg customersupport@rohde-schwarz.com

Zweigniederlassung Köln (+49 22 03) 807-0
Graf-Zeppelin-Straße 18 · 51147 Köln (+49 22 03) 807-50
Postfach 900149 · 51111 Köln customersupport@rohde-schwarz.com

Zweigniederlassung Mitte (+49 61 02) 20 07-0
Siemensstraße 20 (+49 61 02) 80 00 40
63263 Neu-Isenburg customersupport@rohde-schwarz.com

Zweigniederlassung München (+49 89) 41 86 95-0
Mühldorfstraße 15 · 81671 München (+49 89) 40 47 64
Postfach 801449 · 81614 München customersupport@rohde-schwarz.com

Zweigniederlassung Nürnberg (+49 9 11) 64203-0
Donaustraße 36 (+49 9 11) 64203-33
90451 Nürnberg customersupport@rohde-schwarz.com

Zweigniederlassung Telekommunikation (+49 61 02) 20 07-0
Siemensstraße 20 (+49 61 02) 20 07-12
63263 Neu-Isenburg customersupport@rohde-schwarz.com

ADRESSEN WELTWEIT/ADDRESSES WORLDWIDE

Algeria
ROHDE & SCHWARZ Bureau d'Alger (2) 59 24 53
5 B, Place de Laperrine (2) 69 46 08
16035 Hydra-Alger –

Argentina
Precisión Electrónica SRL (14) 331 16 85
Av. Julio A. Roca 710 - Piso 6 (14) 334 51 11
1067 Buenos Aires preelctr@satlink.com

Australia
ROHDE & SCHWARZ Sales (2) 8845 4100
(AUSTRALIA) Pty. Ltd. (2) 9738 3988
Unit 6, 2-8 South Street Service (2) 8845 4188
Rydalmere, N.S.W. 2116 (2) 9638 0832
sales@rsaus.rohde-schwarz.com
service@rsaus. rohde-schwarz.com

Austria
ROHDE & SCHWARZ-ÖSTERREICH (1) 6 02 61 41
Ges. m. b. H. (1) 6 02 61 41-14
Sonnleithnergasse 20 office@rsoe.rohde-schwarz.com
1100 Wien

Azerbaijan
ROHDE & SCHWARZ Azerbaijan 12 93 31 38
Liaison Office Baku 12 93 03 14
Azerbaijan Avenue 35 –
370139 Baku

Baltic Countries siehe/see Denmark

Bangladesh
Business International Ltd. (2) 881 06 53
Corporation Office (2) 882 82 91
House No: 95/A, Block -'F' –
Road No: 4, Banani
Dhaka - 1213

Belgium
ROHDE & SCHWARZ BELGIUM N.V. (2) 7 21 50 02
Excelsiorlaan 31 Bus 1 (2) 7 25 09 36
1930 Zaventem info@rsb.rohde-schwarz.com

Bolivia siehe auch/see also Argentina

RIBCO LTDA. (2) 32 84 03
Av. Mariscal Santa Cruz 1392 (2) 39 30 47
Ed. Cámara Nacional gibatta@caoba.entelnet.bo
de Comercio
Piso 10, Of.1010-1011
La Paz

Brazil
ROHDE & SCHWARZ DO BRASIL LTDA.
Av. Alfredo Egidio de (11) 56 41 12 00
Souza Aranha, 177 (11) 56 41 78 10
1° andar - Santo Amaro
04726-170 São Paulo- SP

Adressen/Addresses

Brunei	GKL Equipment PTE. Ltd.	276 06 26
	#11-01 BP Tower	276 06 29
	396, Alexandra Road	gkleqpt@signet.com.sg
	Singapore 119954	
	Republic of Singapore	
Bulgaria	ROHDE & SCHWARZ	(2) 963 43 34
	Representation Office Bulgaria	(2) 963 21 97
	39, Fridtjof Nansen Blvd.	rohdebg@rsoe.com
	1000 Sofia	
Canada	Kommunikationstechnik/Communications Equipment:	
	ROHDE & SCHWARZ CANADA Inc.	(613) 592 80 00
	555 March Rd.	(613) 592 80 09
	Kanata, Ontario K2K 2M5	–
	Messtechnik/T & M Equipment:	
	TEKTRONIX CANADA, Inc.	(416) 747 50 00
	3280 Langstaff Road, Unit 1	(905) 760 72 41
	Concord, Ontario L4K 5B6	–
Chile	DYMEQ Ltda.	(2) 277 50 50
	Avenida Larraín 6666	(2) 227 87 75
	Santiago	dymeq@entelchile.net
China	ROHDE & SCHWARZ	(10) 64 31 28 28
	Representative Office Beijing	(10) 64 37 98 88
	Parkview Center, Room 602	–
	No. 2 Jiangtai Road,	
	Chao Yang District	
	Beijing 100016, P. R. China	
Colombia	Ferrostaal de Colombia	(1) 415 77 00
	Av. Eldorado Nro. 97-03 Interior 2	(1) 413 18 06
	Santafé de Bogotá, D.C.	mc_fsc@multiphone.net.co
Costa Rica	siehe/see Mexico (EPSA)	
Croatia	siehe/see Austria	
Republic of Cyprus	HINIS TELECAST LTD.	(4) 42 51 78
	Agiou Thoma 18	(4) 42 46 21
	Kiti	
	Larnaca 7550	
Czech Republic	ROHDE & SCHWARZ – Praha, s.r.o.	(2) 24 32 20 14
	Pod Kastany 3	(2) 24 31 70 43
	160 00 Praha 6	rohdecz@rsoe.com
Denmark	ROHDE & SCHWARZ DANMARK A/S	43 43 66 99
	Ejby Industrivej 40	43 43 77 44
	2600 Glostrup	RSDK@post1.tele.dk
Ecuador	REPRESENTACIONES	(2) 25 22 51
	MANFRED WEINZIERL	(2) 25 22 51
	Guanguiltagua 72 (39-93)	mweinzierl@accessinter.net
	Urbanización Jardines del Batán	
	Quito	
Egypt	U.A.S. Universal Advanced Systems	(202) 455 67 44
	31 Manshiet El Bakry St., Heliopolis	(202) 256 17 40
	11341 Cairo	uas@intouch.com
El Salvador	siehe/see Mexico (EPSA)	
Estonia	ROHDE & SCHWARZ DANMARK A/S	(6) 14 31 20
	Estonian Branch Office	(6) 14 31 21
	Narva mnt. 13	
	10151 Tallinn	
Finland	Orbis Oy	(9) 47 88 30
	P.O. B. 15	(9) 53 16 04
	00421 Helsinki	info@orbis.fi
France	ROHDE & SCHWARZ FRANCE	(1) 41 36 10 00
	Immeuble "Le Newton"	(1) 41 36 11 10
	9-11, rue Jeanne Braconnier	–
	92366 Meudon-la-Forêt Cédex	
	Niederlassung/Subsidiary Rennes:	
	ROHDE & SCHWARZ FRANCE	(2) 99 51 97 00
	Sigma 1	(2) 99 41 91 31
	Rue du Bignon	–
	35135 Chantepie	
	Niederlassung/Subsidiary Toulouse:	
	ROHDE & SCHWARZ FRANCE	(5) 61 39 10 69
	Technoparc 3	(5) 61 39 99 10
	B.P.501	–
	31674 Labège Cédex	
	Büros/Offices:	
	Aix-en-Provence	(4) 94 07 39 94
		(4) 94 07 55 11
	Lyon	(4) 78 29 88 10
		(4) 78 29 94 71
	Nancy	(3) 83 54 51 29
		(3) 83 55 39 51
Ghana	KOP Engineering Ltd.	(21) 77 99 13
	P.O. Box 11012	(21) 22 47 69
	3rd Floor Akai House, Osu	
	Accra	
Greece	MERCURY SA.	(1) 722 92 13
	6, Loukianou Str.	(1) 721 51 98
	10675 Athens	mercury@hol.gr
Guatemala	siehe/see Mexico (EPSA)	
Honduras	siehe/see Mexico (EPSA)	
Hong Kong	Schmidt & Co. (HK) Ltd.	25 07 03 33
	9/F North Somerset House	28 27 56 56
	Taikoo Place	frankwong@shk.schmidtgroup.com
	979 King's Road	
	Quarry Bay, Hong Kong	
Hungary	ROHDE & SCHWARZ	(1) 203 02 82
	Budapesti Iroda	(1) 203 02 82
	Etele ut. 68	rohdehu@rsoe.com
	1115 Budapest	
Iceland	siehe/see Denmark	
India	ROHDE & SCHWARZ	(11) 683 74 84
	India Pvt. Ltd.	
	244, Okhla Industrial Estate	rsindiad@vsnl.com
	Phase - III	
	New Delhi 110 020	
Indonesia	P.T. REKANUSA SOLUSI	(21) 576 16 02
	Menara Rajawali,	(21) 576 16 04
	24th floor	–
	Jl Mega Kuningan Lot # 5.1	
	Kawasan Mega Kuningan	
	Jakarta 12950	
Iran	ROHDE & SCHWARZ IRAN	(21) 8 73 02 82
	Liaison Office - Reg. N° RFC 1947	(21) 8 73 02 83
	Dr. Beheschty Ave., Pakistan Ave.,	–
	12th Street N° 1	
	Tehran 15317	

Adressen/Addresses

Ireland
siehe/see Great Britain

Italy
ROHDE & SCHWARZ ITALIA S.p.a. (6) 41 59 81
Via Tiburtina 1182 (6) 41 59 82 70
00156 Roma –

Centro Direzionale Lombardo (2) 95 70 41
Via Roma 108 (2) 95 30 27 72
20060 Cassina de' Pecchi (MI)

Japan
ADVANTEST Corporation (3) 33 42 75 53
RS Sales Department (3) 53 22 72 70
Shinjuku-NS Building, 4-1 yoshimu@inst.advantest.co.jp
Nishi-Shinjuku
Tokyo 163-08, Japan

Jordan
Middle East Development (6) 465 96 71
c/o Jordan Crown Engineering & Trading Co. (6) 465 96 72
P.O. Box 830414
Amman, 11183

Kazakhstan
ROHDE & SCHWARZ Kazakhstan 32 72 63 55 55
Liaison Office Almaty 32 72 63 46 33
Pl. Respubliki 15 –
480013 Almaty

Kenya
Excel Enterprises Limited (2) 55 80 88
Dunga Road (2) 54 46 79
P.O. Box 42 788
Nairobi

Korea
Hana Technica Corp. (2) 514 45 46
Seoul Kangnam, P.O. Box 1458 (2) 514 45 49
Young Dong Bldg. 4F hanateco@unitel.co.kr
63-16 Nonhyun-Dong, Kang Nam-Ku
Seoul

Kuwait
Group Five Trading & Contracting Co. 244 91 72
P.O. Box 26645 244 95 28
Safat 13127
State of Kuwait

Latvia
Rohde & Schwarz Danmark A/S (7) 50 23 55
Latvian Branch Office (7) 50 23 60
Merkela iela 21-301 rsdk@rsdk.rohde-schwarz.com
1050 Riga

Lebanon
Rohde & Schwarz International (1) 465 64 28 Ext. 303
Liaison Office Riyadh (1) 465 64 28 Ext. 229
PO Box 361
c/o Haji Abdullah Alireza & Co.
Riyadh 11411 – KSA

Liechtenstein
siehe/see Switzerland

Lithuania
Rohde & Schwarz Danmark A/S 222 46 62
Lithuanian Office 222 46 62
Lukiskiu 5-228
2600 Vilnius

Luxembourg
siehe/see Belgium

Malaysia
DAGANG TEKNIK SDN. BHD. (3) 7035503/7035568
No. 9, Jalan SS 4D/2 (3) 7 03 34 39
Taman People's Park danik@tm.net.my
47301 Petaling Jaya
Selangor Darul Ehsan

Malta
ITEC – International Technology Ltd. 37 43 00
B'Kara Road 37 43 53
San Gwann itec@keyworld.net

Mexico
Vertrieb Kommunikationstechnik/
Sales of Communications Equipment:
ELECTROINGENIERIA de Precisión (5) 559 76 77
S.A. (EPSA) (5) 575 33 81
Uxmal 520 epsa@compuserve.com
Colonia Vertiz Narvarte
03600 Mexico DF

Vertrieb Messtechnik/Sales of T&M Equipment:
Tektronix S.A. de C.V. (5) 666 63 33
Periférico Sur 5000, 8° Piso (5) 666 63 36
Col. Insurgentes Cuicuilco
Del. Coyoacán
04530 Mexico, D.F.

Nepal
Abishek Trade Links (P) Ltd. (1) 25 69 30
P.O.B. 9700 (1) 24 25 73
Kathmandu Durbar@hotel.mos.com.np

Netherlands
ROHDE & SCHWARZ (30) 600 17 00
NEDERLAND B.V. (30) 600 17 99
Perkinsbaan 1 Rob.DenHartog@rsn.rohde-schwarz.com
3439 ND Nieuwegein

New Zealand
Nichecom (4) 232 32 33
Level 1 Tawa Plaza (4) 232 32 30
210 Main Rd / P.O.B. 56-045 ISDN (4) 237 30 10
Tawa, Wellington robin.hodgson@nichecom.co.nz

Nicaragua
siehe/see Mexico (EPSA)

Nigeria
Ferrostaal (Nigeria) Ltd. (1) 262 00 60
27/29 Adeyemo Alkaija Street (1) 262 00 64
P.O. Box 72021
Victoria Island
Lagos

Norway
ROHDE & SCHWARZ NORGE 23 17 22 50
Østensjøveien 36, P.O.B. 103 BRYN 23 17 22 69
0611 Oslo –

Oman
T&M Equipment and Broadcasting:
Mustafa & Jawad Science & Industry Co. Ltd. 60 20 09
P.O. Box 3340 60 70 66
Post Code 112
Ruwi
Sultanate of Oman

Pakistan
TelcoNet Communications & (51) 26 30 72
Engineering (51) 26 32 11
213/D, Ordnance Road tnc@meganet.com.pk
Rawalpindi-Pakistan-46000

Panama
siehe auch/see also Mexico (EPSA)

ELECTRONICO BALBOA S.A. 614 93 64
Av. El Paical, Edif. El Dorado 236 18 20
Urb. Los Angeles pdubois@ebsa.com
Panama City

Papua-New Guinea
siehe/see Australia

Peru
siehe auch/see also Argentina

BMP INGENIEROS S.A. (1) 225 40 30
Av. José Gálvez Barrenechea 645 (1) 475 15 13
Urb. Corpac - San Borja wmelgarejo@bmp.com.pe
Lima 41

Adressen/Addresses

Philippines	MARCOM Industrial Equipment, Inc.	(2) 8 13 29 31
	MCC P.O.Box 2307	(2) 8 17 05 07
	6-L Mezzanine Suite, Vernida I	
	Condominium120 Amorsolo St.	
	Legaspi Village	
	Makati City/Philippines 3117	
Poland	ROHDE & SCHWARZ	(22) 860 64 90
	Oddzial w Polsce	(22) 860 64 99
	ul. Stawki 2, Pietro 28	rohdepl@rsoe.com
	00-193 Warszawa	
Portugal	TELERUS	
	Sistemas de Telecomunicações, S.A.	(21) 412 35 90
	Rua General Ferreira Martins, Lote 6,2.°B	(21) 412 36 00
	1495 Algés	telerus@mail.telepac.pt
Romania	ROHDE & SCHWARZ	(1) 410 68 46
	Representation Office Bucharest	(1) 411 20 13
	Uranus 98	rohdero@rsoe.com
	Bloc U8, scara 2, etaj 5, ap. 36	
	76102 Bucuresti	
Russian Federation	ROHDE & SCHWARZ	(095) 234 49 62
	Representative Office Moscow	(095) 234 49 63
	Kazachy per. 7	rohderus@rsoe.com
	109017 Moscow	
Saudi Arabia	Rohde & Schwarz Liaison Office	
	c/o Haji Abdullah Alireza Co. Ltd.	(1) 465 64 28
	P.O.B. 361	(1) 465 07 82
	Riyadh 11411	–
Singapore	Vertrieb/Sales:	
	INFOTEL TECHNOLOGIES LTD.	287 68 22
	19 Tai Seng Drive	284 95 55
	Kinergy Building # 06-00	general@infotel.com.sg
	Singapore 535222	
	Service:	
	Rohde & Schwarz	
	Support Centre Asia Pte. Ltd.	846 37 10
	1 Kaki Bukit View	846 00 29
	#04-05/07 Techview	rssca@mbox4.singnet.com.sg
	Singapore 415941	
Slovak Republic	Specialne systemy a software, a.s.	(7) 65 42 25 29
	Svrcic ul	(7) 65 42 07 68
	84104 Bratislava	3s@internet.sk
Slovenia	ROHDE & SCHWARZ	(61) 123 46 51
	Representation Ljubljana	(61) 123 46 11
	Koprska 92	rohdesi@rsoe.com
	1000 Ljubljana	
South Africa	Protea Data Systems (Pty) Ltd	(11) 786 36 47
	Communications & Measurement	(11) 786 58 91
	Division	Colin.Forbes@protea.co.za
	Private Bag X19	
	Bramley 2018	
Spain	ROHDE & SCHWARZ ESPAÑA	(91) 334 10 70
	Salcedo, 11	(91) 729 05 06
	28034 Madrid	rema@rsd.rohde-schwarz.com
Sri Lanka	LANKA AVIONICS	(1) 95 66 78
	658/1/1, Negombo Road	(1) 95 83 11
	Mattumagala	–
	Ragama	
Sudan	SolarMan Co. Ltd.	(11) 47 31 08
	P.O. Box 11 545	(11) 78 17 25
	Karthoum	
Sweden	ROHDE & SCHWARZ SVERIGE AB	(8) 605 19 00
	Flygfältsgatan 15	(8) 605 19 80
	12830 Skarpnäck	info@rss.rohde-schwarz.com
Switzerland	Roschi Rohde & Schwarz AG	(31) 922 15 22
	Papiermühlestrasse 145, Postfach	(31) 921 81 01
	3063 Ittigen	–
Syria	Electro Scientific Office	(11) 231 59 74
	Baghdad Street	(11) 231 88 75
	Dawara Clinical Lab. Building	–
	P.O.B. 8162	
	Damascus	
Tanzania	Security Systems (T) Ltd.	(22) 2 76 00 37
	P.O. Box 7512	(22) 276 02 93
	Dar Es Salaam	
Taiwan	Lancer Communication Co., LTD.	(2) 23 91 10 02
	16F, No. 30, Pei-Ping East Road	(2) 23 95 82 83
	Taipei	rosa.ho@lancercomm.com.tw
Thailand	Vertrieb Kommunikationstechnik/Sales Communications Equipment:	
	TPP Operation Co., Ltd.	(2) 880 93 45
	41/5 MoobanTarinee Boromrajchonnee Rd.	(2) 880 93 47
	Talingchan, Bangkok 10170	–
	Vertrieb Messtechnik/Sales T & M Equipment:	
	Schmidt Scientific (Thailand) Ltd.	(2) 643 13 30-9
	212 Government Housing Bank Bldg.	(2) 643 13 40
	Tower II, 19th Floor, Rama 9 Rd.,	
	Huaykwang, Bangkapi, Bangkok 10320	–
Turkey	ROHDE & SCHWARZ	(216) 385 19 17
	Liaison Office Istanbul	(216) 385 19 18
	Bagdad Cad. 191/3, Ard.	rsturk@superonline.com
	81030 Selamicesme-Istanbul	
Ukraine	ROHDE & SCHWARZ	(044) 268 60 55
	Representative Office Kiev	(044) 268 83 64
	ul. Patrisa Loumoumba, 4	rohdeukr@rsoe.com
	252042 Kiev	
United Arab Emirates	Service-Center für den Mittleren Osten/	
	Service Center for the Middle East:	
	ROHDE & SCHWARZ Emirates L.L.C.	(2) 631 20 40
	P.O.B. 31156	(2) 631 30 40
	Abu Dhabi	–
	ROHDE & SCHWARZ	(2) 63 35 670
	Liaison Office Middle East	(2) 63 35 671
	P.O. Box 311 56	
	Abu Dhabi	–
	Vertrieb/Sales:	
	ROHDE & SCHWARZ Liaison Office Dubai	(4) 39 44 829
	P.O.B. 53726	(4) 39 44 794
	Dubai	–
	R&S BICK Mobile Communication	
	P.O.B. 17466	(4) 81 36 75
	JAFZ, LOB 04-028	(4) 81 36 76
	Dubai	–
United Kingdom	ROHDE & SCHWARZ UK Ltd.	(12 52) 81 13 77
	Ancells Business Park	(12 52) 81 14 47
	Fleet, Hampshire GU 13 8UZ	–
Uruguay	siehe auch/see also Argentina	

AEROMARINE S.A. (2) 400 39 62
Cerro Largo 1497 (2) 401 85 97
11200 Montevideo aeromar@adinet.com.uy

USA
Kommunikationstechnik/Communications Equipment:
ROHDE & SCHWARZ, Inc. (301) 459 88 00
4425 Nicole Drive (301) 459 28 10
Lanham, MD 20706 –

Messtechnik/T & M Equipment:
TEKTRONIX Inc. (800) 835 9433 Ext. 6630
P.O.B. 500, M/S 50-216 (800) 835 7732
Beaverton, OR 97076 –

Venezuela
EQUILAB TELECOM C.A. (2) 34 46 26
Centro Seguros La Paz (2) 239 52 05
Piso 6, Local E-61 r_ramire@equilabtelecom.com.ve
Ava. Francisco de Miranda
Boleita, Caracas 1070

Military customers only:
REPRESENTACIONES BOPIC S.A. (2) 985 21 29
Av. Diego Cisneros (2) 985 39 94
Centro Empresarial Los Ruices incotr@cantv.net
Of. 119, 1er piso
Los Ruices
Caracas

Vietnam
Schmidt Vietnam Co., Ltd. (4) 834 61 86
8/F, Schmidt Tower, Hanoi (4) 834 61 88
Intern. Technology Centre svnhn@schmidt group.com
Cau Giay, Tu Liem, IPO Box 89
Hanoi

Yugoslavia
see/siehe Austria

Nicht aufgeführte Länder/Countries not listed:
ROHDE & SCHWARZ INTERNATIONAL GmbH
P.O.B. 80 14 69
81614 München / Germany
Please fax to +49 89 41 29 136 62

Contents of Manuals for Universal Radio Communication Tester CMU

Operating Manual CMU-K29 (Software Option: AMPS-MS for CMU-B21)

The present operating manual describes the application of the CMU200 for AMPS mobile tests. It gives comprehensive information about the installation of the required software options and about manual and remote control of the instrument. For introduction, some typical measurement tasks are explained in detail using the functions of the graphical user interface.

The manual is organized as follows:

Chapter 1	Describes the steps necessary for installing the software and putting the instrument into operation.
Chapter 2	Gives an introduction to the application of the CMU for AMPS mobile tests and presents some typical measurement examples.
Chapter 3	Gives an overview of the user interface and describes the concepts of measurement control and instrument configuration.
Chapter 4	Represents the reference chapter providing detailed information on all functions of the user interface and their application.
Chapter 5	Describes the basics of remote control of the instrument for AMPS mobile tests.
Chapter 6	Lists all remote control commands defined for AMPS mobile tests. At the end of the chapter the commands are grouped together according to their function (measurement groups or configurations) and sorted in alphabetical order.
Chapter 10	Contains an index for the operating manual.

Operating Manual CMU200/CMU300

In the operating manual for CMU basic unit you will find everything that is needed to make yourself familiar with your Universal Radio Communication Tester CMU. This includes information about the technical specifications of the CMU, the controls and connectors on the front and rear panel, necessary steps for putting the instrument into operation, the basic operating concept, manual and remote control. Typical measurement tasks are explained in detail using the functions of the user interface and program examples.

General concepts of CMU control are described in the operating manual CMU and not repeated in the manuals for the individual software options.

Service Manual Instrument

The service manual informs on how to check compliance with rated specifications, on instrument function, repair, troubleshooting and fault elimination. It contains all information required for the maintenance of the CMU by exchanging modules.

Service Manual Modules

The service manual modules is not delivered with the instrument but may be obtained from your R&S service department with the order number 1100.4903.91.

Service manual modules contains information about the individual modules of the CMU. This comprises the test and adjustment of the modules, fault detection within the modules and the interface description.

Further Operating Manuals for Network Tests

The operating manuals listed in the following table describe the test of radio communication equipment supporting different standards by means of the CMU and the appropriate software and hardware options. The network test operating manuals are organized like the present AMPS operating manual.

		For Options		
Manual	**Order Number**	**Type**	**Description**	**Stock No.**
Operating Manual CMU-K21/-K22/-K23	1115.6088.12	CMU-K21	GSM900-MS for CMU-B21	1115.6007.02
		CMU-K22	GSM1800-MS for CMU-B21	1115.6107.02
		CMU-K23	GSM1900-MS for CMU-B21	1115.6207.02
Operating Manual CMU-K27/-K28	1115.6688.12	CMU-K27	TDMA800-MS for CMU-B21	1115.6607.02
		CMU-K28	TDMA1900-MS for CMU-B21	1115.6707.02
Operating Manual CMU-K30/-K31/-K32/-K33	1115.4185.12	CMU-K30	GSM400-BS for CMU-B21	1115.4004.02
		CMU-K31	GSM900-BS for CMU-B21	1115.4104.02
		CMU-K32	GSM1800-BS for CMU-B21	1115.4104.02
		CMU-K33	GSM1900-BS for CMU-B21	1115.4104.02
		CMU-K39	MOC/MTC	1115.4791.02
		CMU-K41	EDGE for CMU-K30/31/32/33	1115.4604.02
Operating Manual CMU-K53	1115.5081.12	CMU-K53	Bluetooth for CMU	1115.5000.02
Operating Manual CMU-K81/-K82	1115.5581.12	CMU-K81	CDMA800-MS (IS95) for CMU-B81	1115.5500.02
		CMU-K82	CDMA1900-MS (IS95) for CMU-B81	1115.5600.02

Frequently Used Abbreviations

AMPS	*Advanced Mobile Phone System; by AMPS mobile stations we understand devices supporting the analog AMPS standard, specified in TIA/EIA-136.xxx (once IS-136) and related standards*
Att.	*Attenuation*
CC	*(Analog) Control Channel*
Ch.	*Channel*
DCC	*Digital Color Code*
Dist.	*Distortion*
Ext.	*External*
MIN	*Mobile Identification Number*
Min.	*Minimum*
Mod.	*Modulation*
MPCI	*Mobile Protocol Capability Indicator*
MS	*Mobile Station*
Reg.	*Registration*
SAT	*Supervisory Audio Tone*
SCC	*SAT Color Code*
SID	*System Identity*
SN	*(Electronical) Serial Number*
ST	*Signalling Tone*
TX	*Transmitter*
VC	*Voice Channel*
VMAC	*Voice Mobile Attenuation Code*

Contents

1 Installation 1.1

Software Installation or Update 1.1

Enabling Software Options 1.2

1 Installation

This chapter describes how to enable, to install or update the firmware containing the *AMPS-MS* software option for the Universal Radio Communication Tester CMU200.

Before proceeding to perform any of the steps described in this manual, please make sure that the instrument is properly connected and put into operation according to the instructions given in chapter 1 of the CMU manual. The hardware and software options available are shown in the *Startup* menu. The status of the software options required for AMPS-MS device tests is indicated in the line "AMPS-MS":

- If *available* is indicated, the CMU is ready to perform AMPS mobile tests. In this case you may skip this chapter, except if you wish to update the current software version.
- If *disabled* is indicated, the software option must be enabled.
- If *not available* is indicated, the software must be installed via the PCMCIA interface or the floppy disk drive.

Software Installation or Update

The CMU is always delivered with the latest software version available. New CMU software versions are available for download on the R&S Lotus Notes Service board. To be loaded via the CMU's PCMCIA interface, the software must be copied to one or several flash disks/memory cards or PCMCIA hard disks as explained in the instructions supplied with the software download version. An appropriate memory card CMU-Z1, order no. 1100.7490.02, can be obtained from Rohde & Schwarz.

Note: *If your CMU is equipped with a floppy disk drive (option CMU-U61), a set of installation floppy disks must be generated instead of a flash disk. All other steps do not depend on the storage medium.*

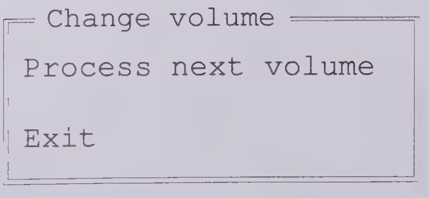
To install the software proceed as follows:

- ➢ Switch off the CMU.
- ➢ Insert the flash disk into one of the two slots of the PCMCIA interface.
- ➢ Switch on the CMU.

The installation is started automatically while the CMU performs its start-up procedure. To this end the *VersionManager* is called up.

- ➢ Use the softkeys on the left side of the display to select the item *Install new software version.*
- ➢ If more than one version or more than one installation medium is available, use the softkeys again to select the desired version/installation medium.

The installation is started. To indicate that the flash disk must be changed the CMU issues the *Change volume* message:



```
Change volume
Process next volume

Exit
```

- ➢ Replace the current disk with the disk requested.
- ➢ Use the cursor up/down keys to select “Process next volume” (default setting).
- ➢ Press *ENTER* to confirm that the new disk has been inserted and to continue the installation.

To monitor the installation process the CMU displays messages such as:

```
...Volume # 1 has been processed
```

```
...Volume # 2 to be installed next
```

After processing the last floppy disk the CMU displays the messages:

```
...Installation completed
...please remove the installation media to reboot
...press any key to continue
```

➢ Remove the disk and press any key to reboot the CMU.

The CMU reboots and performs a firmware update of the hardware modules. This may take a few minutes. Afterwards the new software version is started and the instrument is ready to operate.

For more information on software installation refer to chapter 4 of your CMU service manual instrument.

Enabling Software Options

A new CMU software option purchased is ready to operate after it is enabled by means of a key code supplied with the option. This key code is to be entered into the *Option Enable* popup window which in turn can be opened via from the *Setup – Options* menu. For details refer to Chapter 4 of the CMU operating manual.

Note: *The CMU software is delivered in complete versions containing all software options available. Software installation and enabling of software options are completely independent from each other.*

Contents

2 Getting Started

2 Getting Started........ 2.1

Preparing an AMPS Mobile Phone Test........ 2.2

Non Signalling Mode........ 2.6

Transmitter Measurements........ 2.8

Receiver Measurements........ 2.14

Signalling Mode........ 2.16

2 Getting Started

The following chapter presents a sample AMPS mobile test with the universal radio communication tester CMU. It is intended to provide a quick overview of the function groups *AMPS-MS Non Signalling* and *AMPS-MS Signalling* and to lead through the most common tests which are performed on AMPS mobile phones.

Before starting any measurement with the CMU, please note the instructions for putting the instrument into operation given in chapter 1 of the operating manual for the CMU basic unit. In chapters 2 to 4 of that manual you will also find information on customizing the instrument and the display according to your personal preferences. General notes on controls, menu types, and on the entry or selection of values and parameters are given in chapter 3 of the CMU manual and will not be repeated here.

For installation instructions for the *AMPS* software (CMU-K29) refer to chapter 1 of the present manual.

The tests reported below include

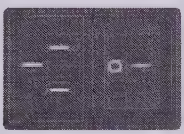
- Connection of the phone and selection of the AMPS function group
- Transmitter and receiver tests in *Non Signalling* mode
- Selection and measurement of signalling parameters

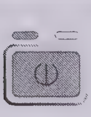
The steps to perform are explained on the left side of each double-page together with the results obtained on the CMU screen. On the right side, additional information is given. We also point out alternative settings and related measurements which could not be reported in detail.

The principles of manual operation are discussed in chapter 3. For a systematic explanation of all menus, functions and parameters including AMPS background information refer to the reference part in chapter 4.

Preparing an AMPS Mobile Phone Test

This chapter describes how to use the CMU for AMPS mobile phone tests. As a prerequisite for starting the session, the instrument must be correctly set up and connected to the AC power supply as described in chapter 1 of the CMU operating manual. Furthermore, the AMPS software must be properly installed following the instructions given in chapter 1 of the present manual.

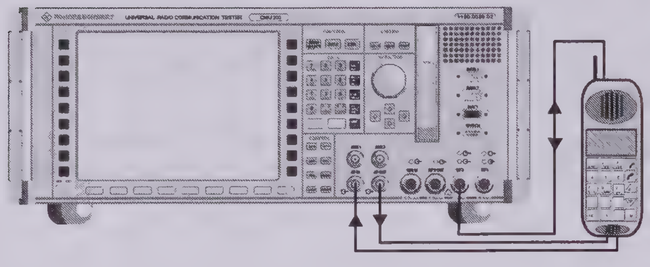




Step 1

- Switch on the CMU using the mains switch at the rear. ①
- Check the operating mode of the instrument at the *ON/STANDBY* key on the front panel.②

⇓



Step 2

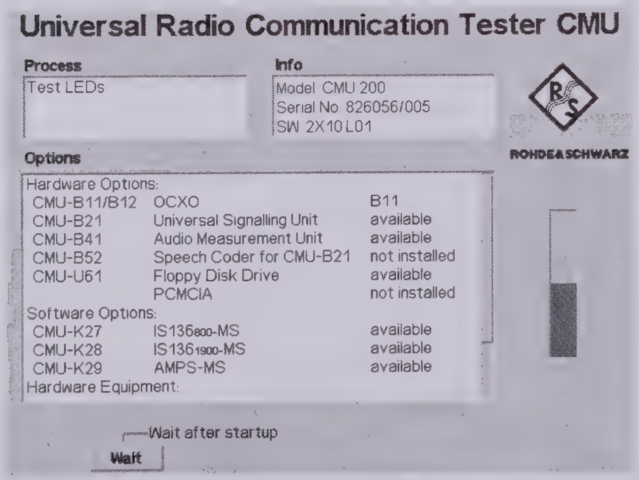
- Connect the bi-directional RF connector RF 2 of the CMU to the antenna connector of the mobile phone. In addition, make sure that your mobile phone is properly connected to the AF input/output connectors *AF IN* and *AF OUT* of the CMU. ③
- Make sure that the mobile phone is supplied with the correct operating voltage (battery or power supply).

⇓

Step 3

- Switch on the CMU by pressing the *ON/STANDBY* key on the front panel.

⇓



Universal Radio Communication Tester CMU

Process

Test LEDs

Info

Model CMU 200
Serial No 826056/005
SW 2X10 L01

Options

Hardware Options:

CMU-B11/B12	OCXO	B11
CMU-B21	Universal Signalling Unit	available
CMU-B41	Audio Measurement Unit	available
CMU-B52	Speech Coder for CMU-B21	not installed
CMU-U61	Floppy Disk Drive	available
	PCMCIA	not installed

Software Options:

CMU-K27	IS136$_{800}$-MS	available
CMU-K28	IS136$_{1900}$-MS	available
CMU-K29	AMPS-MS	available

Hardware Equipment:

The startup menu is displayed while the CMU performs a power-up test. ④

After a few seconds the CMU displays the last menu used in the previous session.

Additional Information...

... on Step 1

① Mains switch on the rear panel

When the mains switch at the rear is set to the *OFF* position, the complete instrument is disconnected from the power supply. When the mains switch is set to the *ON* position, the instrument is in standby mode or in operation, depending on the position of the power switch on the front panel.

② *ON/STANDBY* key on the front panel

The *ON/STANDBY* key at the front of the instrument determines whether the instrument is in standby mode or in operation.

Standby mode:
Only the reference frequency oscillator is supplied with operating voltage, and the yellow LED *(STANDBY)* is lit.

Operation:
The green LED *(ON)* is lit and all modules of the instrument are supplied with operating voltage.

... on Step 2

③ RF and AF connection of the mobile phone

To carry out the tests described in this chapter, it is essential to provide the following signal paths:

- Transmission of an RF carrier signal from the tester to the mobile and back. The forward path signal (from the tester to the mobile) is essential for RX measurements; the reverse path signal (from the mobile to the tester) is measured in TX measurements.
- Transmission of an AF test signal from the tester (connector *AF OUT)* to the input of the mobile transmitter (in particular for TX audio frequency response measurements).
- Transmission of an AF signal from the output of the mobile receiver to the tester (connector *AF IN,* for RX measurements).

The details of the test setup depend on your measurement equipment. For the RF connection, a high-quality cable should be used, ideally with an attenuation of less than 0.5 dB. For portable phones, the car installation set supplied by telephone manufacturers can be used.

Alternative Settings and Measurements

☞ Chapter 1 of CMU manual

The CMU provides two bidirectional RF connectors *RF1* and *RF2* differing by their input and output level ranges. *RF2* is the recommended standard connector for AMPS mobile phones (see data sheet).

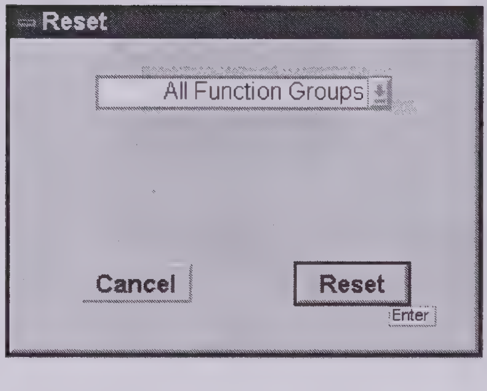
The unidirectional connectors *RF4 IN* and *RF3 OUT* are intended for connection of modules requiring high input levels or modules with low RF output levels. *RF4 IN* and *RF3 OUT* can also be used to connect AMPS mobiles off the air via antenna adapters.

Input and output connectors can be selected in the *AF/RF* ⊸ tab of the *Connect. Control* menu that is called up via the softkey of the same name to the right of the header line of each measurement menu.

Step 4

- Press the *RESET* key.

The *Reset* popup menu is opened.

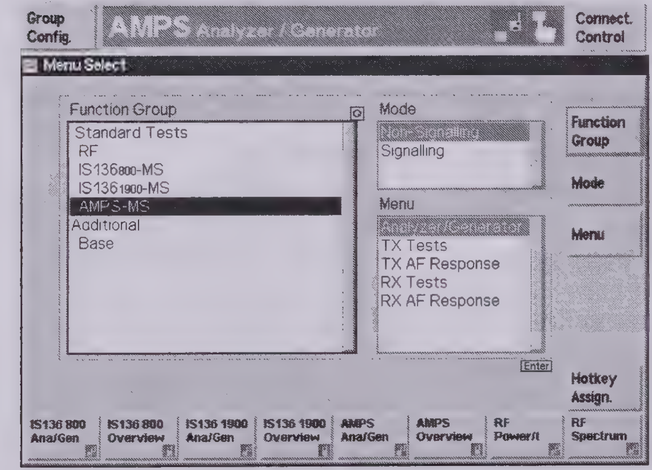


- Use the left and right arrow keys to toggle between the two buttons *Cancel* and *Reset*.
- Select *Reset* and press the *ENTER* key.
- In the popup window opened *(Are you sure?)*, select *Yes* to confirm the instrument reset.

The CMU indicates that it performs a general reset of all device settings and is then ready to carry out the following steps. The *Reset* popup menu is closed automatically.

Step 5

- Press the *Menu Select* key to open the *Menu Select* menu.⑤



The *Menu Select* menu indicates the function groups available. If a function group is selected, the corresponding modes and measurement menus are indicated.

- Select the AMPS-MS function group.
- Select the *Non Signalling* test mode.
- Select the *Analyzer/Generator* menu.
- Press the *Enter* key to activate the measurement selected and open the *Analyzer/Generator* menu.

Additional Information...

... on Step 3

④ **Startup menu**

The startup menu displays the following information:

- The status of the startup test *(Process)*
- The device name, serial number and software version *(Info)*
- The options and equipment installed *(Options)*
- The progress of the startup test (*Startup* bar graph)

Before starting a measurement, a reset is recommended to set the instrument with all its functions into a definite state.

... on Step 5

⑤ **Menu Select menu**

The *Menu Select* menu shows all function groups installed on your CMU. Function Group *AMPS-MS* is subdivided in the two test modes *Non Signalling* and *Signalling*, each containing a number of measurement menus.

The differences between the test modes are explained in the sections *Non Signalling* Mode and *Signalling Mode* below. The measurements provided in both test modes are largely identical.

Alternative Settings and Measurements

☞ Chapter 4 of CMU manual

That chapter also contains information on customizing the CMU.

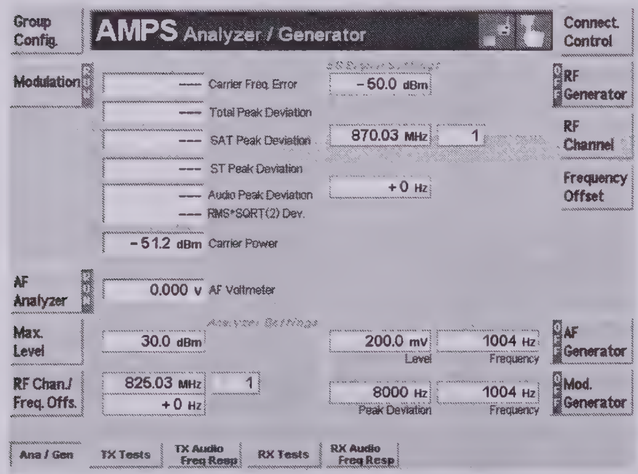
☞ Chapter 3 and chapter 4

Non Signalling Mode

In the *Non Signalling* mode, a AMPS-specific RF signal can be generated and a RF signal with AMPS characteristics analyzed. Compared to the *Signalling* mode test times may be reduced considerably. Moreover, the measurements are not restricted to the specified channel and MS output power ranges of the network.①

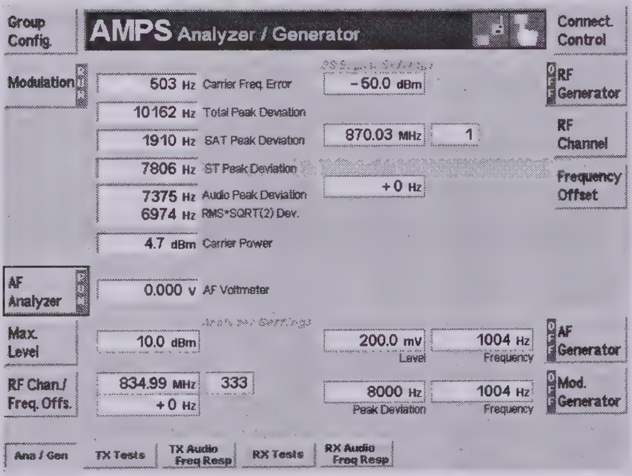
Transmitter Measurements

In tests assessing the mobile station transmitter quality, the CMU demodulates and analyzes the RF output signal of the MS transmitter, which can be modulated with an audio tone, the SAT, or the ST. To test the transmitter audio frequency response, the CMU provides an additional audio test signal.



--- Carrier Freq. Error
--- Total Peak Deviation
--- SAT Peak Deviation
--- ST Peak Deviation
--- Audio Peak Deviation
--- RMS*SQRT(2) Dev.
-51.2 dBm Carrier Power
0.000 V AF Voltmeter
-50.0 dBm
870.03 MHz 1
+0 Hz
Max. Level 30.0 dBm
RF Chan./Freq. Offs. 826.03 MHz 1 +0 Hz
200.0 mV Level 1004 Hz Frequency
8000 Hz Peak Deviation 1004 Hz Frequency

⇓



503 Hz Carrier Freq. Error
10162 Hz Total Peak Deviation
1910 Hz SAT Peak Deviation
7806 Hz ST Peak Deviation
7375 Hz Audio Peak Deviation
6974 Hz RMS*SQRT(2) Dev.
4.7 dBm Carrier Power
0.000 V AF Voltmeter
-50.0 dBm
870.03 MHz 1
+0 Hz
Max. Level 10.0 dBm
RF Chan./Freq. Offs. 834.99 MHz 333 +0 Hz
200.0 mV Level 1004 Hz Frequency
8000 Hz Peak Deviation 1004 Hz Frequency

⇓

Step 1

The *Analyzer/Generator* menu configures the signals generated by CMU (right half of the menu) and sets the RF and AF analyzers.②

At present, all parameters are set to default values. They can be changed directly in the *Analyzer/Generator* menu. User-defined parameters will be saved for later sessions when the CMU is switched off.

In addition, the current results of the Modulation measurement which is part of the MS transmitter tests *(TX Tests)* are displayed. Most of the output fields show "---", indicating that no valid measurement results are available. ③

- ➢ At your mobile station, activate the TX carrier (using an arbitrary voice carrier channel supported by your mobile and an appropriate output power), the SAT, the ST, and the TX audio signal.
- ➢ Press the *Max. Level* softkey and adapt the maximum expected RF input level to the output power of the mobile. ④
- ➢ Press the *RF Chan./Freq. Offs.* softkey and set the RF channel equal to the voice carrier channel of the mobile phone.

The main results of the *TX Tests – Modulation* measurement (see below) are now indicated in the output fields associated to the *Modulation* softkey.

Additional Information...

Alternative Settings and Measurements

Non Signalling Mode

① **Test mode of the mobile phone**

To demonstrate the features of the *Non Signalling* mode, we use an AMPS mobile phone that has been set to its "test mode". The settings and properties of the test mode depend on the mobile type.

The CMU *Non Signalling* mode is also suitable for module tests.

... on Step 1

② **Analyzer/Generator menu**

In the right half, the *Analyzer/Generator* menu contains three configuration panels used to configure the RF generator, the *AF Generator*, and the *Modulation Generator* signals.

☞ Chapter 4

To facilitate and speed up the operation, many CMU settings are accessible from different menus. The RF generator and analyzer settings are also part of the *Signal tab* in the Connect. Control menu.

The assignment between RF carrier frequency and channel number is according to AMPS specifications. As the CMU simulates a base station, the generator signal corresponds to the forward path (signal direction from the base station towards the mobile station), the signal analyzed corresponds to the reverse path (signal direction from the mobile station towards the base station). The channel/frequency assignment changes accordingly.

The RF frequency can be set in multiples of 10 kHz. With an additional *Frequency Offset*, an RF signal with an arbitrary frequency that is in the range supported by the tester can be generated and analyzed.

Selecting a definite RF channel and level in the *BS Signal Settings* panel implies that signals with these properties are generated.

Selecting a definite RF frequency in the *Analyzer Settings* panel implies that only signals with this frequency are analyzed.

③ **Measurement and Generator State**

The state indication of the different measurements and generators is included in the corresponding softkeys. For ongoing measurements, the results in the output fields are constantly updated.

For various reasons, an output field may fail to show a valid measurement result (indication "---"):

- The analyzer settings do not match the properties of the input signal.
- The input signal is missing.
- The measurement is switched off *(OFF* is indicated in the softkey controlling the measurement).

The current options for the measurement state are *RUN* (default) and *OFF*. A third state, *HLT*, occurs after a single-shot measurement is terminated (see below, step 3).

Once selected, the *TX Tests – Modulation* measurement can be switched off and on by means of the toggle key *ON/OFF*.

Generators may also be switched on (state *ON)* and off (state *OFF)* by means of the *ON/OFF* key.

④ **Max. Level**

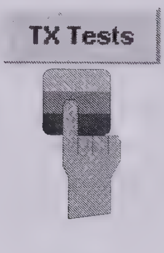
The *Max. Level* softkey sets the maximum RF input power which can be measured and is used to adjust the RF input path to the expected power of the measured signal. The permissible range *Max. Level* depends on the RF connector and the external attenuation used.

☞ Chapter 4

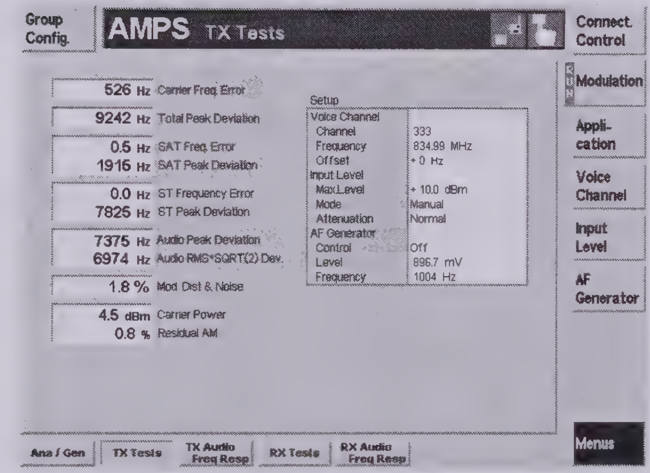
The RF *Max. Level* and the analogous *AF Max. Level* can also be set in the *Group Config.* menu. If *Automatic* is selected, the *AF Max. Level* adapts itself to the power of the AF input signal.

Step 2

➢ Press the *TX Tests* hotkey to switch over to the *TX Tests* measurement menu.



⇓



526 Hz	Carrier Freq. Error
9242 Hz	Total Peak Deviation
0.5 Hz	SAT Freq. Error
1916 Hz	SAT Peak Deviation
0.0 Hz	ST Frequency Error
7825 Hz	ST Peak Deviation
7375 Hz	Audio Peak Deviation
6974 Hz	Audio RMS*SQRT(2) Dev.
1.8 %	Mod Dist & Noise
4.5 dBm	Carrier Power
0.8 %	Residual AM

Setup

Voice Channel	
Channel	333
Frequency	834.99 MHz
Offset	+ 0 Hz
Input Level	
Max.Level	+ 10.0 dBm
Mode	Manual
Attenuation	Normal
AF Generator	
Control	Off
Level	896.7 mV
Frequency	1004 Hz

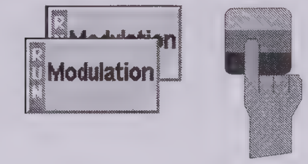
The *TX Tests* menu gives an overview of quantities characterizing the mobile transmitter quality. ⑤

Measurement results are displayed in the left half of the menu. The *Setup* table in the right half shows the test configurations that can be changed by means of the softkeys on the right softkey bar and associated hotkeys or in the *TX Tests* configuration popup menu.

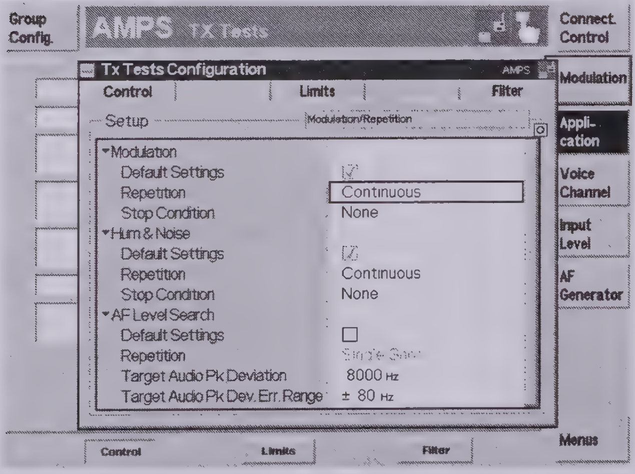
⇓

Step 3

➢ Press the *Modulation* softkey twice to open the *TX Tests Configuration* menu.⑥



⇓



Setup — Modulation/Repetition

▾Modulation	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
▾Hum & Noise	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
▾AF Level Search	
Default Settings	☐
Repetition	Single Shot
Target Audio Pk Deviation	8000 Hz
Target Audio Pk Dev. Err. Range	± 80 Hz

➢ Press the *Control* hotkey to open the *Control* tab of the configuration menu.

➢ Select the *Modulation – Repetition* table line (rotary knob), press *ENTER*, and turn the rotary knob to select *Single Shot.*⑦

➢ Press *ENTER* to confirm and then *ESCAPE* to close the *TX Tests Configuration* menu and return to the main menu.

The *TX Tests* measurement is stopped after one statistic count. The status indication next to the *Modulation* softkey is set to *HLT.*⑧

⇓

Additional Information...

Alternative Settings and Measurements

... on Step 2

⑤ **TX Tests – Modulation**

The *TX Tests – Modulation* menu shows the frequency error and peak deviation of the voice carrier, the SAT, the ST, and the audio signal. All these signals are transmitted by the mobile phone over the RF carrier. The SAT, ST, and the audio signal are demodulated from the carrier and measured in separate input paths.

It is instructive to switch on and off the individual signals at the mobile station and check the behavior of the measured quantities.

☞ Chapter 4, section *TX Tests*.

... on Step 3

⑥ **TX Tests Configuration menu**

The *TX Tests Configuration* menu contains three tabs to set

- Parameters controlling the scope of the measurement *(Control)*
- Tolerance values *(Limits)*
- The input path configuration *(Filter)* of the *TX Tests*

☞ Chapter 4.

Settings made in the *TX Tests Configuration* menu apply to *TX Tests* only.

Settings made in *the Group Config.* and *Connect. Control* menus apply to the entire function group *AMPS Non Signalling* but can be overwritten in the individual measurement groups.

⑦ **Repetition mode and Stop Condition**

If no stop condition is imposed *(Stop Condition = None),* the *Repetition* mode determines whether the measurement is

- Continued until explicitly stopped *(Continuous)*
- Stopped after one measurement cycle, i.e. after the system has settled and a valid result is obtained *(Single Shot)*

With *Stop Condition = On Limit Failure*, the measurement is stopped as soon as one of the results is out of tolerance.

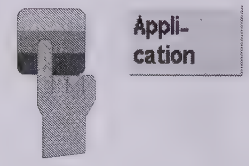
☞ Chapter 3.

The stop condition *On Limit Failure* should be selected if the limit check represents the main purpose of the measurement.

The limits can be modified in the *Limits* tab of the *TX Tests Configuration* menu.

⑧ **HLT state**

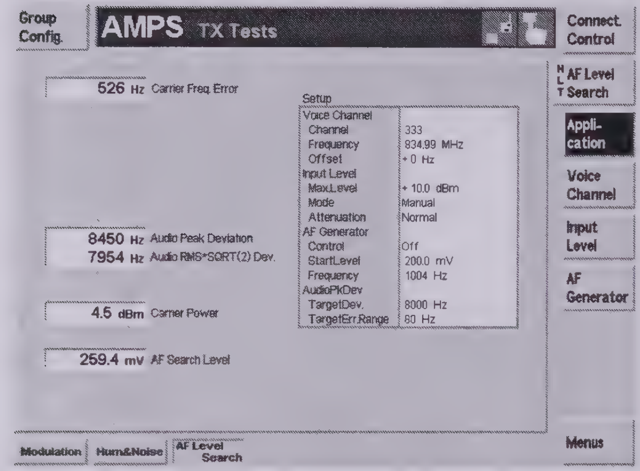
After termination of one single shot, the measurement is in the *HLT* state. This means that the last results are displayed in the output fields and no longer updated. The measurement is stopped, but a new single shot can be triggered via the *CONT/HALT* key.



Step 4

- ➢ Press the *Application* softkey to change the hotkeys displayed below the diagram.①
- ➢ Press the *AF Level Search* hotkey to change the application.②

⇓



526 Hz Carrier Freq. Error
8450 Hz Audio Peak Deviation
7954 Hz Audio RMS*SQRT(2) Dev.
4.5 dBm Carrier Power
259.4 mV AF Search Level

Setup

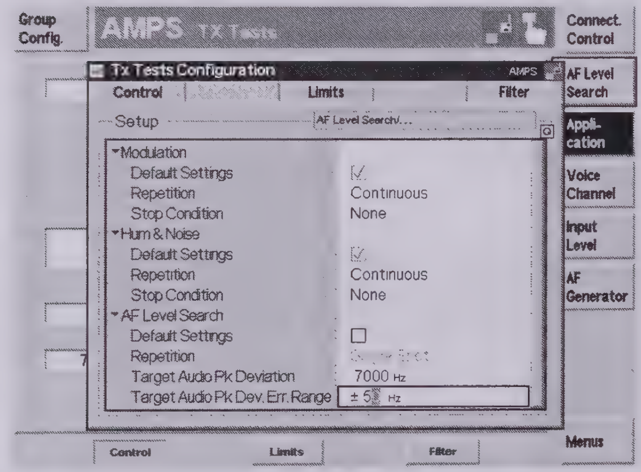
Voice Channel	
Channel	333
Frequency	834.99 MHz
Offset	+ 0 Hz
Input Level	
Max.Level	+ 10.0 dBm
Mode	Manual
Attenuation	Normal
AF Generator	
Control	Off
StartLevel	200.0 mV
Frequency	1004 Hz
AudioPkDev	
TargetDev.	8000 Hz
TargetErr.Range	80 Hz

The *AF Level Search* menu is displayed. In this application, the CMU searches the AF level corresponding to a definite audio peak deviation *(Target Deviation)*. The result is indicated in the lowest output field of the menu *(AF Search Level)*.

The target deviation can be set in the Control tab of the *TX Tests Configuration* menu:

- ➢ Press the *AF Level Search* softkey twice to open the *TX Tests Configuration* menu.

⇓



Setup AF Level Search/...

▾Modulation	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
▾Hum & Noise	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
▾AF Level Search	
Default Settings	☐
Repetition	
Target Audio Pk Deviation	7000 Hz
Target Audio Pk Dev. Err. Range	± 5 Hz

Step 5

- ➢ Press the *Control* hotkey to open the *Control* tab of the configuration menu.
- ➢ Select the *AF Level Search – Target Audio Pk Deviation* table line (rotary knob), press *ENTER*, and set a target deviation of 7000 Hz. Press *ENTER* to confirm your entries.③
- ➢ Select the *AF Level Search – Target Audio Pk Dev. Error Range* table line (rotary knob), press *ENTER*, and set an error range of 50 Hz. Press *ENTER* to confirm your entries.
- ➢ Press *ESCAPE* to close the *TX Tests Configuration* menu and return to the main menu.

⇓

Additional Information...

Alternative Settings and Measurements

... on Step 4

① **Softkeys and hotkeys**

To leave more space for the output fields or enlarge the diagram area in graphical measurement menus, the left softkey column is often not used. Instead, hotkeys are assigned to the softkeys on the right side to complement their functionality. These hotkeys are displayed across the hotkey bar below the diagram while the softkey is selected.

Some of the softkey/hotkey combinations provide settings that can be also accessed via configuration menus. For example, the *Input Level* settings are also accessible in the *Input Level* tab in the *Group Configuration* menu. Entries via hotkey and via the *Group Configuration* menu are equivalent; the last value entered is valid for the entire function group and test mode.

☞ Chapter 4.

The *Application* softkey displays the hotkeys to switch over between the different *TX Tests* applications (see below).

The *Voice Channel* softkey defines the AF analyzer settings.

The *Input Level* softkey configures the RF input level and external attenuation.

The *AF Generator* softkey configures the AF generator and the parameters of the *AF Level Search* iteration (see below).

The *Menus* softkey displays the hotkeys to switch over between the different measurement groups *in AMPS-MS Non Signalling.*

② **Applications**

Applications are different measurements belonging to the same measurement group. Each application is assigned its own set of configuration parameters. Therefore, the applications of a measurement group can be configured individually and serviced in parallel.

The TX Tests menu comprises the three applications *Modulation*, *Hum & Noise*, and *AF Level Search*.

☞ Chapter 5 of CMU manual

Another set of applications is provided in the *RX Tests* menu.

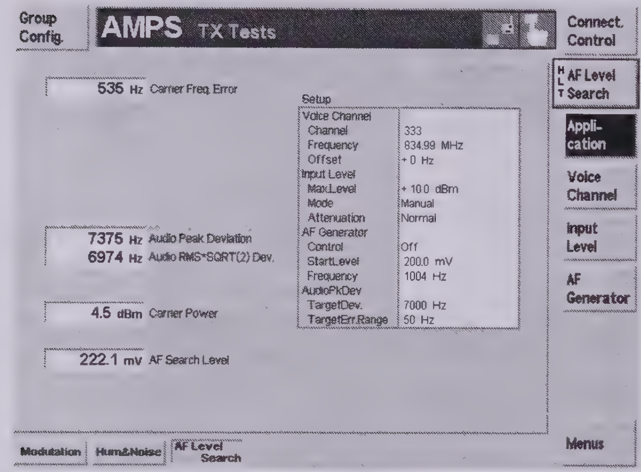
... on Step 5

③ **AF Level Search Routine**

As a monotonic, ascending function of the AF level, the audio peak deviation can be inverted in its whole setting range. It makes sense therefore to ask for the AF level that corresponds to a given audio peak deviation. The CMU determines this target AF level by iteration, starting at the AF level set via the *AF Generator – Start Level* hotkey. The iteration is stopped as soon as the measured peak deviation is close enough to the target peak deviation set in the *Control* tab of the *TX Tests Configuration* menu. The corresponding AF level is displayed in the *AF Level Search* output field of the *TX Tests* menu.

☞ Chapter 4.

A search routine similar to the *AF Level Search* is provided in the *Sensitivity* application of the *RX Tests* menu. The receiver sensitivity measurement consists of determining the RF level corresponding to a definite *Target SINAD*.



535 Hz Carrier Freq. Error

7375 Hz Audio Peak Deviation
6974 Hz Audio RMS*SQRT(2) Dev.

4.5 dBm Carrier Power

222.1 mV AF Search Level

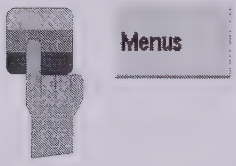
Setup

Voice Channel	
Channel	333
Frequency	834.99 MHz
Offset	+ 0 Hz
Input Level	
Max.Level	+ 10.0 dBm
Mode	Manual
Attenuation	Normal
AF Generator	
Control	Off
StartLevel	200.0 mV
Frequency	1004 Hz
AudioPkDev	
TargetDev.	7000 Hz
TargetErr.Range	50 Hz

The AF level search is performed again, this time with a lower target deviation of 7000 Hz. As expected, the new AF search level is smaller than the previous one, which was obtained with a target deviation of 8000 Hz.

Before leaving the *TX Tests* menu, we recommend you to modify more of the settings and test their impact on the measurement results. ④

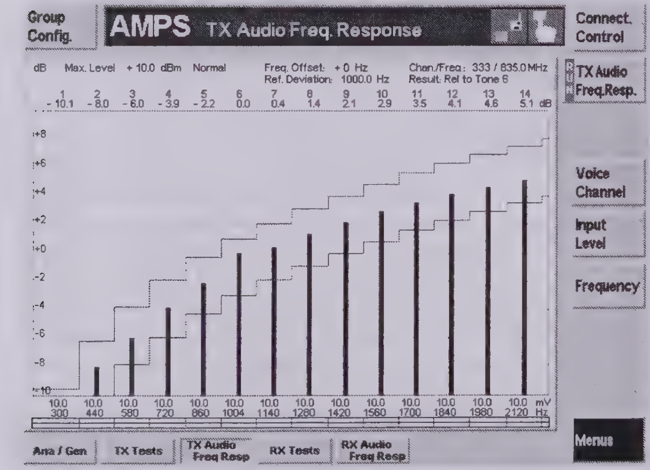
⇓



⇓

Step 6

- ➢ Press the *Menus* softkey to change the hotkeys displayed below the diagram.
- ➢ Press the *TX Audio Freq. Response* hotkey to change the measurement group.


Group Config.
AMPS TX Audio Freq. Response
Connect. Control
TX Audio Freq.Resp.
Voice Channel
Input Level
Frequency
Menus
Ana / Gen
TX Tests
TX Audio Freq Resp
RX Tests
RX Audio Freq Resp
dB
1 2 3 4 5 6 7 8 9 10 11 12 13 14
- 10.1 - 8.0 - 6.0 - 3.9 - 2.2 0.0 0.4 1.4 2.1 2.9 3.5 4.1 4.6 5.1 dB
+8 +6 +4 +2 +0 -2 -4 -6 -8 -10
10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 mV
300 440 580 720 860 1004 1140 1280 1420 1560 1700 1840 1980 2120 Hz

Max. Level + 10.0 dBm Normal
Freq. Offset: + 0 Hz
Ref. Deviation: 1000.0 Hz
Chan./Freq.: 333 / 835.0 MHz
Result: Rel to Tone 6

The *TX Audio Freq. Response* menu shows the electrical audio frequency response of the mobile station transmitter represented by a set of up to 14 out of 20 distinct test points. ⑤

Together with the bar graph, a tolerance template as specified in the standard is displayed. Settings (at present, the default settings) and scalar results are displayed in two parameter lines above the diagram.

- ➢ Press the *Frequency* softkey and then the *Scale* hotkey to shift the horizontal axis (AF frequency) of the diagram.
- ➢ Press the *Input Level* softkey and then the *Scale Min* and *Scale Max* hotkey to modify the vertical axis (AF frequency response) of the diagram.
- ➢ Press the *TX Audio Freq. Response* softkey twice to call up the *TX Audio Freq. Response* configuration menu.⑥

Additional Information...

④ Advanced Settings

Besides the Control tab discussed above, the *TX Tests Configuration* menu comprises two other tabs providing the following settings:

Limits	Tolerance values; upper and (if applicable) lower limits for all measurement results in the *TX Tests* menu
Filter	Configuration of the audio input path by varying and switching on or off various filter stages in the audio receive path

Alternative Settings and Measurements

☞ Chapter 4.

The *Filter* settings have a direct impact on the results obtained in the audio receive path. A circuit diagram and an application example is given in the *Path Configuration* sections in chapter 4.

... on Step 6

⑤ TX Audio Frequency Response Diagram

The *TX Audio Frequency Response* menu is an example of a graphical measurement menu: The main measurement result (the electrical audio frequency response of the mobile transmitter as a function of the frequency of its audio input signal) is displayed in a two-dimensional diagram (a bar chart). The vertical scale of the diagram can be adjusted via softkeys and hotkeys.

Test configurations are shown in two parameter lines above the diagram; they can be modified by means of the softkey/hotkey combinations or in a special configuration menu (see below).

In general, the tolerance limits in graphical measurement menus are functions of the variable scaling the x-axis and therefore called *limit lines.* The *TX Audio Frequency Response* menu shows two step functions corresponding to an upper and a lower limit line; both limit lines can be modified in the configuration menu.

☞ Chapter 4.

The general menu types are discussed in chapter 3 of the CMU manual.

It is possible to disable the measurement at a particular test point and remove the corresponding bar from the diagram. This is done in the *Freq./Lev.* tab of the *TX Audio Frequency Response Configuration* menu, see below.

⑥ TX Audio Frequency Response Configuration

The *TX Audio Frequency Response Configuration* popup menu contains four tabs to set

- Parameters controlling the measurement and its scope *(Control)*
- Tolerance values *(Limit Lines)*
- The test points (frequencies and voltages) for the measurement *(Freq./Lev.)*
- The input path configuration *(Filter)*

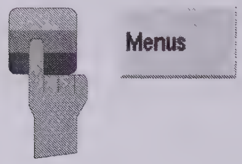
The name and function of tabs belonging to different measurement groups was chosen to be as similar as possible. For example, the *Filter* tab is identical to the *Filter* tab of the *TX Tests Configuration* menu discussed before.

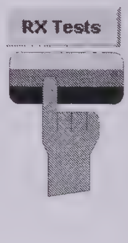
☞ Chapter 4.

The *Tone Def.* tab defines the frequency and RMS voltage of the test tones at which the audio frequency response is measured. These two values are indicated below the x-axis of the test diagram. Note that the frequencies of the tones may be arbitrary (not necessarily in ascending order). The **numbers** of the tones (1 to 20) define the x-axis of the test diagram.

Receiver Measurements

In tests assessing the mobile station receiver quality, the CMU provides an RF voice signal that can be modulated with a modulation signal (in the AF range), the SAT, and the ST, and measures the AF output signal of the MS receiver fed in via *AF IN*.

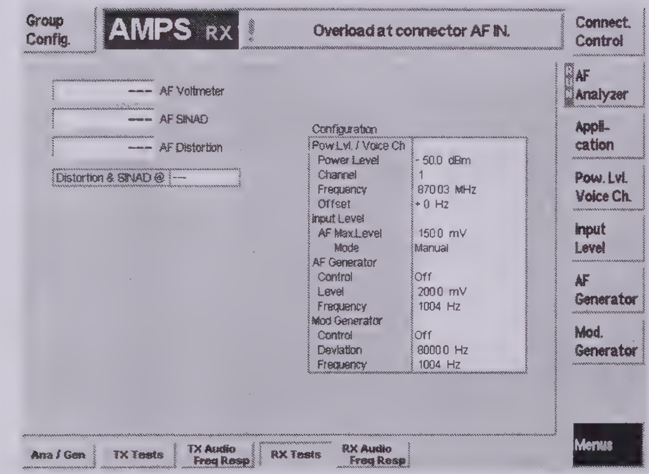




Step 1

- ➢ Press the *Menus* softkey to change the hotkeys displayed below the diagram.
- ➢ Press the *RX Tests* hotkey to change the measurement group.

⇓



Overload at connector AF IN.

--- AF Voltmeter
--- AF SINAD
--- AF Distortion
Distortion & SINAD @ ---

Configuration

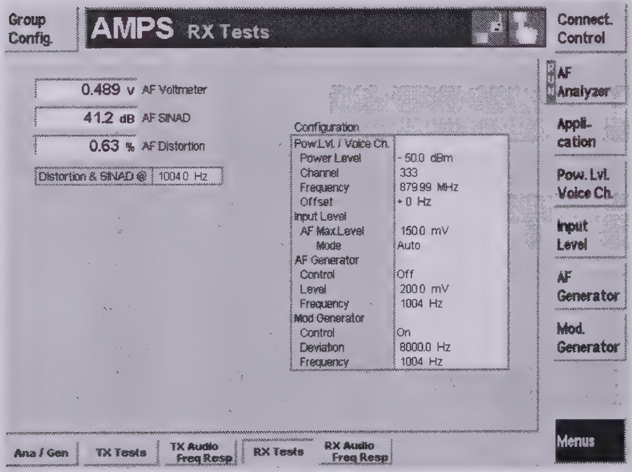
Pow.Lvl. / Voice Ch	
Power Level	- 50.0 dBm
Channel	1
Frequency	870.03 MHz
Offset	+ 0 Hz
Input Level	
AF Max.Level	150.0 mV
Mode	Manual
AF Generator	
Control	Off
Level	200.0 mV
Frequency	1004 Hz
Mod Generator	
Control	Off
Deviation	8000.0 Hz
Frequency	1004 Hz

The *RX Tests* menu gives an overview of quantities characterizing the mobile receiver quality. ①

Measurement results are displayed in the left half of the menu. The *Configuration* table in the right half shows the test configurations that can be changed by means of the softkeys on the right softkey bar and associated hotkeys or in the *TX Tests* configuration popup menu.

At present, all parameters are set to default values. The output fields show "---", indicating that no valid measurement results are available. The reason is that the CMU provides no appropriate RF input signal to the MS receiver.

⇓



0.489 V AF Voltmeter
41.2 dB AF SINAD
0.63 % AF Distortion
Distortion & SINAD @ 1004.0 Hz

Configuration

Pow.Lvl. / Voice Ch.	
Power Level	- 50.0 dBm
Channel	333
Frequency	879.99 MHz
Offset	+ 0 Hz
Input Level	
AF Max.Level	150.0 mV
Mode	Auto
AF Generator	
Control	Off
Level	200.0 mV
Frequency	1004 Hz
Mod Generator	
Control	On
Deviation	8000.0 Hz
Frequency	1004 Hz

Step 2

- ➢ Press the *Ana./Gen.* hotkey to return to the Analyzer/Generator menu.
- ➢ Switch on the RF generator (press the *RF Generator* softkey and the *ON/OFF* key).
- ➢ Press the *RF Channel* softkey and adjust the RF frequency to a value supported by your mobile phone.
- ➢ Switch on the *Mod. Generator.* ②
- ➢ Press the *Group Config.* softkey and the *ON/OFF (EXP/COMP)* key to expand the table sections. Set the *AF Max. Level – Mode* to *Auto.* ③
- ➢ Close the *Group Config.* menu (press *ESCAPE* or *Group Config.* again) and press *RX Tests* to return to the *RX Tests* menu.

Additional Information...

... on Step 1

① RX Tests – AF Analyzer

In the *AF Analyzer* (default) application, the *RX Tests* menu shows the quantities characterizing the AF output signal of the MS receiver: RMS voltage *(AF Voltmeter)*, *AF SINAD* (signal to noise and distortion ratio), and *AF Distortion* (total harmonic distortion) of the signal measured at input connector *AF IN*. The output of the MS receiver and all measured quantities depend on the signal modulating the RF voice carrier signal (softkey *Mod. Generator)*. The frequency of the *Mod. Generator* signal is therefore indicated in an output field below the measurement results.

Note that, compared to TX tests, a reverse signal path is used in RX tests: The CMU provides an RF signal (modulated with an AF frequency) but measures the AF signal from the DUT.

... on Step 2

② Modulation Generator

It is essential to distinguish the different signal generators of the CMU and their purpose in the different types of measurements:

- The *RF Generator* provides an RF voice channel carrier signal that can be modulated with the signal of the *Mod. Generator* (modulation signal), the SAT, and the ST, if so desired. An RF carrier signal modulated with a modulation signal is required for MS receiver measurements *(RX Tests, RX Audio Frequency Response)*.
- The *AF Generator* provides an AF signal that is output via *AF OUT*. This signal is required for *TX Audio Frequency Response* measurements.
- The *Mod. Generator* provides an AF signal that is modulated onto the RF voice channel carrier. An RF carrier signal modulated with a modulation signal is required for MS receiver measurements *(RX Tests, RX Audio Frequency Response)*.
- The *SAT Generator* and the *ST Generator* provide signals with a definite frequency and peak deviation that can also be used to modulate the RF voice channel carrier.

③ Autoranging

If *AF Max. Level – Mode* is set to *Auto*, the CMU measures the average input level at *AF IN* and adjusts the input path such that the maximum AF level that can be measured corresponds to the measured value plus an appropriate overload margin. Alternatively, a fixed *AF Max. Level* can be entered manually.

For all RF and AF input connectors, observe the level ranges reported in the data sheet.

Alternative Settings and Measurements

☞ Chapter 4,
section RX Tests.

Like the *TX Tests* measurement group, the *RX Tests* group is split up in three different applications, each with its own set of configurations and measured quantities. The three applications are named *AF Analyzer, Hum & Noise*, and *Sensitivity*.

In the *Sensitivity* application, a search routine determines the RF level corresponding to a definite SINAD (receiver sensitivity).

☞ Chapter 4.

Instead of a fixed signalling tone (ST), the *ST Generator* is able to provide a wide-band data signal specified in the standard.

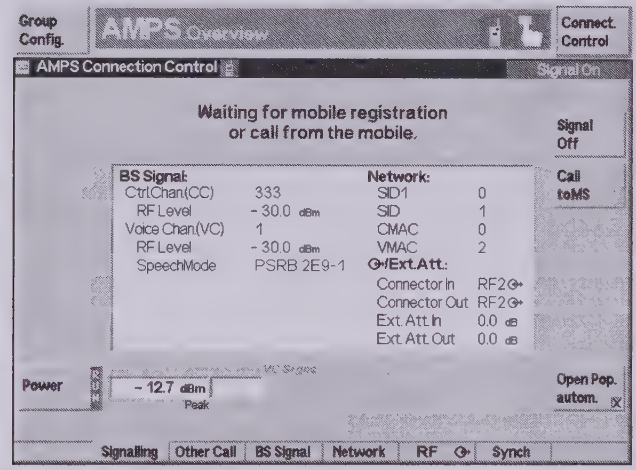
☞ Chapter 4.

The *RX Audio Freq. Response* menu measures the electrical audio frequency response of the MS receiver. It is controlled like the *TX Audio Freq. Response* menu.

Signalling Mode

In the *Signalling* mode the CMU first transmits a control channel signal to which the mobile is able to synchronize. A call can then be established from either the CMU or the mobile. The measurement must be triggered by the signal transmitted by the mobile or by the CMU signalling unit; an external trigger signal can not be used.

The signalling process is controlled via the *Connection Control* popup menu. The first of four *Signalling* tabs contained in the *Connection Control* popup menu is automatically displayed when the *Signalling* Mode is selected (see *Menu Select* menu on page 2.4; for the following examples, *AMPS-MS Signalling* with the *Overview* menu was selected).



Waiting for mobile registration
or call from the mobile.

BS Signal:
Ctrl.Chan.(CC) 333
RF Level - 30.0 dBm
Voice Chan.(VC) 1
RF Level - 30.0 dBm
SpeechMode PSRB 2E9-1

Network:
SID1 0
SID 1
CMAC 0
VMAC 2

/Ext.Att.:
Connector In RF2
Connector Out RF2
Ext. Att. In 0.0 dB
Ext. Att. Out 0.0 dB

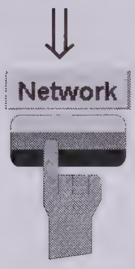
Power - 12.7 dBm Peak

Step 1

The *Signalling (Signal On)* tab indicates the parameters characterizing the signals generated by the CMU *(BS Signal)*.①

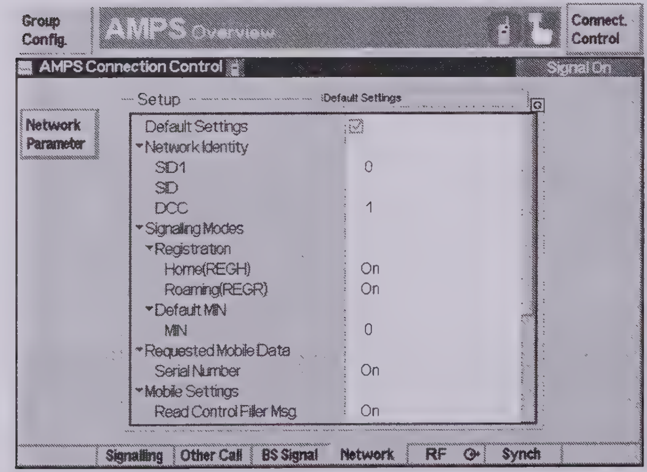
In addition the system identity, the mobile attenuation codes, and the characteristics of the input and output connectors are shown.②

Below the list, the *Power* softkey shows the current status of the wide-band power measurement for RF input signals, the current measured peak power and its ratio to the effective radiated power of the mobile.③



Step 2

- ➢ Press the *Network* hotkey.



Setup — Default Settings

Default Settings ☑
Network Identity
SID1 0
SID
DCC 1
Signaling Modes
Registration
Home(REGH) On
Roaming(REGR) On
Default MIN
MIN 0
Requested Mobile Data
Serial Number On
Mobile Settings
Read Control Filler Msg. On

The *Network* tab is displayed. ④

- ➢ Press the *ON/OFF* key to expand the menu tables.
- ➢ Select the *Default MIN – MIN* field and enter the 34-bit default mobile station identification number of your mobile phone.

Additional Information...

... on Step 1

① **BS Signal**

The CMU is able to generate two different RF carrier signals (control channel and voice channel) that can be configured separately. This allows a complete simulation of what happens in a real AMPS network.

② **Network, ⊸/Ext.Att.**

The network is identified by the *SID,* consisting of the *SID 1* (14-bit system identity 1), plus a 1-bit identifyer for the channel system (A or B). These codes are transmitted to the mobile station on the control channel. The CMU uses the default settings shown in the diagram on the left side.

Input/output connectors suitable for the type of measurements and signal levels must be chosen – see section *RF and AF connection* on page 2.3. An external input/output attenuation value can be specified in order to compensate for known attenuations of the input/output signal like those caused by cables.

③ **Input level**

The softkey *Power* has no configuration menu assigned but can be used like any other softkey controlling a measurement. In particular, it is used to switch over between the measurement states *RUN* and *OFF* (softkey selection plus *ON/OFF* key) and *RUN/HLT* (softkey selection plus *CONT/HALT* key).

... on Step 2

④ **Network parameters**

The *Network* tab defines a variety of parameters related to the network and the operating mode of the mobile station.

The purpose of these settings is to simulate the operating conditions of a mobile station in the AMPS network as realistically as possible. Many of the settings have an impact on the speed of the *Signalling* measurements.

Alternative Settings and Measurements

☞ Chapter 4.

The control and voice channels are configured in the *BS Signal* tab of the *Connection Control* menu. To access this tab press the associated hotkey.

☞ Chapter 4.

The network identity and other parameters characterizing the network are configured in the *Network* tab of the Connection Control menu. To access this tab press the associated hotkey (see below).

Input/output connectors and external attenuations are configured in the *RF* ⊸ tab.

☞ CMU manual chapter 3.

See also the diagrams on measurement control in chapter 5 of the present manual.

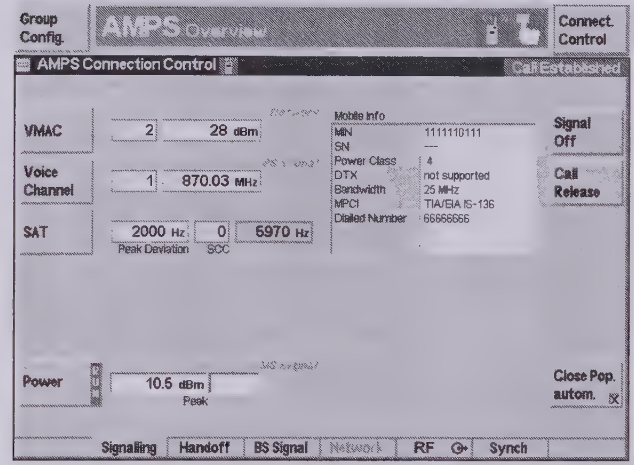
☞ Chapter 4.

If the MIN of the mobile station is not known, the CMU is unable to set up a call. Instead, a registration or a call must be initiated from the mobile station. After first registration, or after a call has been established for the first time, the MIN is transferred to the tester and is available for future calls. MS registration can also be enabled or disabled in the *Network* tab.

⇓

➢ Press the *Call to MS* softkey.

The header message *Paging in progress* is displayed. When the mobile starts ringing, the *Signalling (Alerting)* tab is displayed.



VMAC 2 28 dBm

Voice Channel 1 870.03 MHz

SAT 2000 Hz Peak Deviation, 0 SCC, 5970 Hz

Power 10.5 dBm Peak

Mobile Info
MIN 1111110111
SN ---
Power Class 4
DTX not supported
Bandwidth 25 MHz
MPCI TIA/EIA IS-136
Dialled Number 66666666

As soon as the mobile is picked up, the *Signalling (Call Established)* tab is displayed (this tab is closed automatically after a short while but can be reopened by pressing the *Connect. Control* softkey).

The *Signalling (Call Established)* tab presents a comprehensive list of the signalling parameters (see *Mobile* Info on page 2.19).

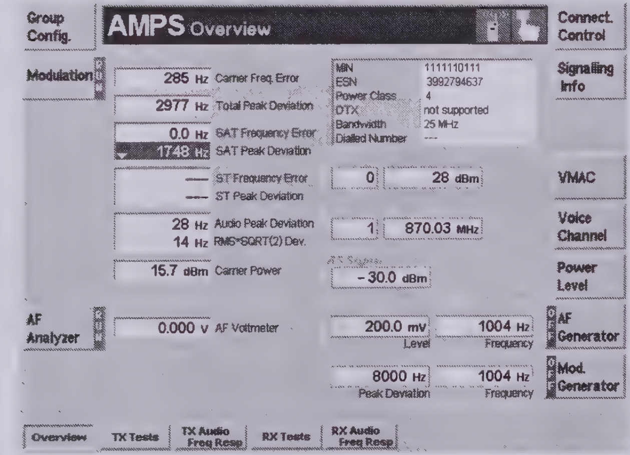
Besides the voice mobile attenuation code (VMAC) ⑤, the parameters of the voice channel signals transmitted by the CMU ⑥, and the SAT can be configured.

⇓

Step 3

➢ Press the *Connect. Control* softkey or the *ESCAPE* key.

The *Connect. Control* menu is closed; the CMU displays the *Overview* menu.



285 Hz Carrier Freq. Error
2977 Hz Total Peak Deviation
0.0 Hz SAT Frequency Error
1748 Hz SAT Peak Deviation
--- ST Frequency Error
--- ST Peak Deviation
28 Hz Audio Peak Deviation
14 Hz RMS*SQRT(2) Dev.
15.7 dBm Carrier Power
0.000 V AF Voltmeter

MIN 1111110111
ESN 3992794637
Power Class 4
DTX not supported
Bandwidth 25 MHz
Dialled Number ---

VMAC 0 28 dBm

Voice Channel 1 870.03 MHz

Power Level −30.0 dBm

AF Generator 200.0 mV Level, 1004 Hz Frequency

Mod. Generator 8000 Hz Peak Deviation, 1004 Hz Frequency

The *Overview* menu indicates the most important settings in the function group *AMPS-MS Signalling* and the main results of the *TX Tests – Modulation* measurements (the *ST Frequency Error* and the *ST Peak Deviation* can not be measured in *Call Established* state; see *Force ST* softkey in Chapter 4). Moreover the signalling info from the mobile station is displayed. ⑦

MS transmitter tests *(TX Tests, TX Audio Frequency Response)* and receiver tests *(RX Tests, RX Audio Frequency Response)* can be performed in close analogy to the *Non Signalling* mode. The differences between the two modes are related to the settings which can be made at the mobile station.

Additional Information...

Alternative Settings and Measurements

... on Step 3

⑤ **Mobile Attenuation Code (VMAC)**

Dynamic power control is used in AMPS networks to reduce the output power of the mobile station as far as possible: In practice the mobile station is set to one of eight Voice Mobile Attenuation Codes *(VMAC)* ranging from 0 to 7, where VMAC equal to 0 corresponds to the largest nominal output power.

The *power class* characterizes the nominal maximum output power of the mobile. The Effective Radiated Power (ERP) of the mobile is a function of both its VMAC and its power class.

The VMAC can be used to control the maximum expected RF input level at the CMU and to vary the RF input power for the individual measurements.

☞ Chapter 4.

VMAC levels and power classes are listed in section *Overview of the Function Group* in chapter 4.

⑥ **Voice channel**

The channel number of the BS voice channel signal is defined according to AMPS specifications as explained for the *Non Signalling* mode (forward path, see *Analyzer/Generator menu* on page 2.7).

☞ Chapter 4.

VMAC, Voice Channel and Trigger

The VMAC of the mobile station and the voice channel number can be changed in all measurement groups while a call is established. This is in contrast to the *Non Signalling* mode where no settings concerning the device under test can be made.

Finally the two test modes differ in the trigger settings available: In the *Non Signalling* mode an external trigger signal can be used whereas in *Signalling* mode, the measurements must be triggered either by the input signal or by the CMU signalling unit.

☞ Chapter 4.

⑦ **Mobile Info**

The *Mobile Info* list shows the basic properties of the connected mobile station. Note that the values shown are no default values (like the *Default MIN* set in the *Network* tab) but represent the information provided by the mobile station and transferred to the CMU. The parameters are therefore available in the *Call Established* and *Registered* signalling states only.

☞ Chapter 4.

For a comprehensive overview of signalling states and possible transitions refer to the figure at the beginning of section *AMPS Mobile Tests*.

Contents

3 Manual Control 3.1

Menu Structure **3.1**
- Test Modes 3.1
- Configurations 3.2
- Measurement Groups 3.3

General Settings **3.5**

Menu Overview **3.6**
- AMPS Non Signalling – General Configurations 3.6
- AMPS Non Signalling – TX Tests and TX Audio Freq. Response 3.7
- AMPS Non Signalling – RX Tests and RX Audio Freq. Response 3.8
- AMPS Signalling – General Configurations I 3.9
- AMPS Signalling – General Configurations II 3.10
- AMPS Signalling – TX Tests and TX Audio Freq. Response 3.11
- AMPS Signalling – RX Tests and RX Audio Freq. Response 3.12

3 Manual Control

This chapter gives a brief survey of the operating concept and structure of the user interface AMPS MS tests. The CMU was designed for maximum operating convenience and flexibility. All instrument functions are grouped together in menus, each of them provides a number of related configuration settings or displays a group of measured quantities. All menus show a similar structure so that many settings, once defined, can be used in several menu groups. Switchover between the different menu groups and test modes *(Non Signalling – Signalling)* is possible at any time.

In the following, the different measurement modes and measured quantities are discussed. Settings and measurement parameters frequently encountered are explained from a general point of view.

The formal aspects of measurement control are discussed in more detail in chapter 5 *(Remote Control – Basics)*. For a presentation of the CMU's control elements, menu types and dialog elements within the menus refer to chapter 3 of the operating manual for the CMU basic unit.

Menu Structure

The menus used to control AMPS-MS measurements can be arranged in different ways. From a functional point of view, they form the following groups:

- The two test modes Signalling and Non Signalling provided for each function group
- General configurations (Group Configuration, Connection Control), measurement groups (Receiver Quality, TX Tests, TX Audio Freq. Response, RX Tests, RX Audio Freq. Response), and configurations specific to these measurement groups (TX Tests Configuration, TX Audio Freq. Response Configuration, RX Tests Configuration, RX Audio Freq. Response Configuration).

In a more formal sense, the CMU uses main menus, popup menus, graphical measurement menus and dialog windows of various size. This aspect is discussed in chapter 3 of the CMU operating manual.

Test Modes

AMPS-MS measurements are performed in one of the two modes *Signalling* or *Non Signalling*. The *Non Signalling* mode is typically used for module tests or test of mobiles in a special "test mode". The *Signalling* mode serves to measure the mobile phone performance under realistic operating conditions where the CMU mimics an AMPS base transceiver station.

Definition The term signalling denotes all actions necessary to establish, control and terminate a communication between the base station (CMU) and the mobile phone. The signalling messages conveyed allow the mobile station and the network to discuss the management of issues either related to the user or concerning technical aspects of the communication.

Non Signalling Mode In the *Non Signalling* mode, the CMU generates an RF voice signal that can be frequency-modulated with an AF modulation signal, the SAT, and the ST and analyzes the modulated RF carrier signal with AMPS characteristics retransmitted by the device under test. The test signal may be inside or outside the designated AMPS channel range.

To test the transmitter quality, the CMU provides an additional AF test signal that is applied to the input of the mobile station transmitter. To test the receiver quality, the CMU analyzes the AF output signal from the mobile station receiver. No signalling parameters are transferred, and no call is set up, so that test times can be reduced considerably.

Signalling Mode

In the *Signalling* mode, the CMU transmits a control channel (CC) signal *(BS Signal)* to which the mobile phone can synchronize. With this signal, a call setup and registration of the mobile may be initiated by either the mobile or the CMU. A call from the current to another network can be set up, and an established call can be handed off from the current to another network.

The CMU is able to configure a broad range of network parameters, to vary the settings and monitor the VMAC and DMAC of the mobile phone. With the appropriate RF and AF signal configuration, transmitter and receiver measurements can be performed as in the *Non Signalling* mode.

Symbols for Signalling Mode and State

The *signalling mode* and *state* is indicated to the left of the operating mode in each main menu and graphical measurement menu (see chapter 3 of CMU operating manual). The following symbols occur in function group *AMPS-MS*:

📱	Non signalling mode
📱	Signalling mode, Signal Off
📱	Signalling mode, Signal On
📱	Signalling mode, Registered
📱	Signalling mode, Call Established

Configurations

The CMU offers a wide range of settings for the signal generators and analyzers, the signalling procedures, and the individual measurements. Configurations may apply to the whole function group *(Group Configuration, Connection Control,* signalling parameters) or to a particular measurement.

Group Configuration

The *Group Config.* softkey is located to the left of the title bar in each main and graphical measurement menu. It opens a popup menu configuring

- The CMU receiver settings *(Input Level* tab*)*

All settings made in the *Group Config.* menu are valid for the whole function group. Most of them can be overwritten, however, by means of the softkeys and hotkeys offered in the graphical measurement menus.

Connection Control

The *Connect. Control* softkey is located to the right of the title bar in each main and graphical measurement menu. It opens a popup menu with several tabs configuring and controlling

- The signal generators and analyzers of the instrument *(Signal* in Non Signalling, *BS Signal* in Signalling mode)
- The RF connectors to be used and the external attenuation *(RF Input/Output)*
- The reference signal and the system clock *(Synch.)*
- In *Signalling* mode, all actions changing the CMU's signalling state *(Signalling)*
- In *Signalling* mode, a call *(Other Call)* or a handoff (Handoff) to another network

- In *Signalling* mode, parameters of the network and the mobile station under test *(Network)*

All settings made in the *Connect. Control* menu are valid for the whole function group.

Configuration of measurements

A popup menu offering specific settings is assigned to most measurement groups *(TX Tests, TX Audio Freq. Response, RX Tests, RX Audio Freq. Response).* The following parameters can be defined in separate tabs:

- The repetition mode and stop condition for the measurement *(Control)*
- Tolerances for the measured quantities *(Limits, Limit Lines)*
- Statistic count and display mode *(Statistics)*

These settings are explained in more detail below (see section *General Settings* on page 3.5).

Configuration via hotkeys

The softkeys and associated hotkeys in the graphical measurement menus provide the most important configurations for the current measurement; see chapter 4 and chapter 3 of the CMU operating manual. Settings may via hotkeys supersede the corresponding *Group Configuration* settings.

Measurement Groups

Measurement results are indicated in two different ways:

- Discrete values and parameters are displayed in output fields, lists and tables. In remote control, these results are referred to as scalars.
- Relatively small sets of test points are viewed in a bar graph. In remote control, results of this type are also referred to as scalars.

While the measurement is running in repetition mode *Continuous* (see page 3.5), the results are constantly updated. As shown in the table below, the measurement groups slightly differ in the two test modes.

Table 3-1 Measurement Groups in the *Signalling* and *Non Signalling* Mode

Non Signalling	**Signalling**
Analog AMPS (Function group AMPS-MS)	
AMPS: Analyzer/Generator Configuration of the RF signal, the AF and the (AF) modulation signal generated, RF analyzer settings. AF analyzer results, results of the *Modulation* measurement.	**AMPS: Overview** Configuration of the voice channel signal, the AF and the (AF) modulation signal generated. AF analyzer results, results of the *Modulation* measurement, and parameters of the mobile station are indicated.
AMPS: TX Tests Measurement of modulation parameters (frequency stability and frequency deviation) characterizing the MS transmitter and of quantities characterizing the amount and the source of unwanted signals in the mobile phone output (hum & noise, residual amplitude modulation, modulation distortion and noise), including limit check.	**AMPS: TX Tests** Measurement of modulation parameters (frequency stability and frequency deviation) characterizing the MS transmitter and of quantities characterizing the amount and the source of unwanted signals in the mobile phone output (hum & noise, residual amplitude modulation, modulation distortion and noise), including limit check. The measurement can be performed at variable VMAC levels of the mobile phone.
AMPS: TX Audio Freq. Response Measurement of the electrical audio frequency response of the MS transmitter at up to 20 distinct audio frequencies including limit check.	**AMPS: TX Audio Freq. Response** Measurement of the electrical audio frequency response of the MS transmitter at up to 20 distinct audio frequencies including limit check. The measurement can be performed at variable VMAC levels of the mobile phone.
AMPS: RX Tests Measurement of quantities characterizing the amount and the source of unwanted signals in the receiver audio output of the mobile phone (AF distortion, hum & noise, SINAD), and of the MS receiver sensitivity level including limit check.	**AMPS: RX Tests** Measurement of quantities characterizing the amount and the source of unwanted signals in the receiver audio output of the mobile phone (AF distortion, hum & noise, SINAD), and of the MS receiver sensitivity level including limit check. The measurement can be performed at variable VMAC levels of the mobile phone.
AMPS: RX Audio Freq. Response Measurement of the electrical audio frequency response of the MS receiver at up to 20 distinct audio frequencies including limit check.	**AMPS: RX Audio Freq. Response** Measurement of the electrical audio frequency response of the MS receiver at up to 20 distinct audio frequencies including limit check. The measurement can be performed at variable VMAC levels of the mobile phone.

A graphical overview of the menus is given at the end of this chapter.

General Settings

A number of settings can be made in several of the configuration menus assigned to the measurement groups. In combination, these settings define the scope of the measurement, i.e. the duration of the measurement and the results displayed. The following brief overview is intended to avoid confusion of terms.

Application

Applications are different measurements belonging to the same measurement group. They effectively split up a measurement group into various related subgroups which can be configured separately.

They are selected via the *Application* softkey in the graphical measurement menus.

Repetition Mode

The *repetition mode* defines when a measurement that is not stopped by a limit failure (see stop condition *On Limit Failure* below) will be completed. Two modes are available for all measurements:

Single Shot	The measurement is stopped after one *statistic count* (digital network tests) or after a valid result is obtained (analog network tests).
Continuous	The measurement is continued until explicitly terminated by the user; the results are periodically updated.

A third repetition mode is available with remote control:

Counting	Repeated single shot measurement with a fixed number of statistic counts.

The *repetition mode* is set in the *Control* tab of the configuration popup-menus assigned to the individual measurement groups.

Stop Condition

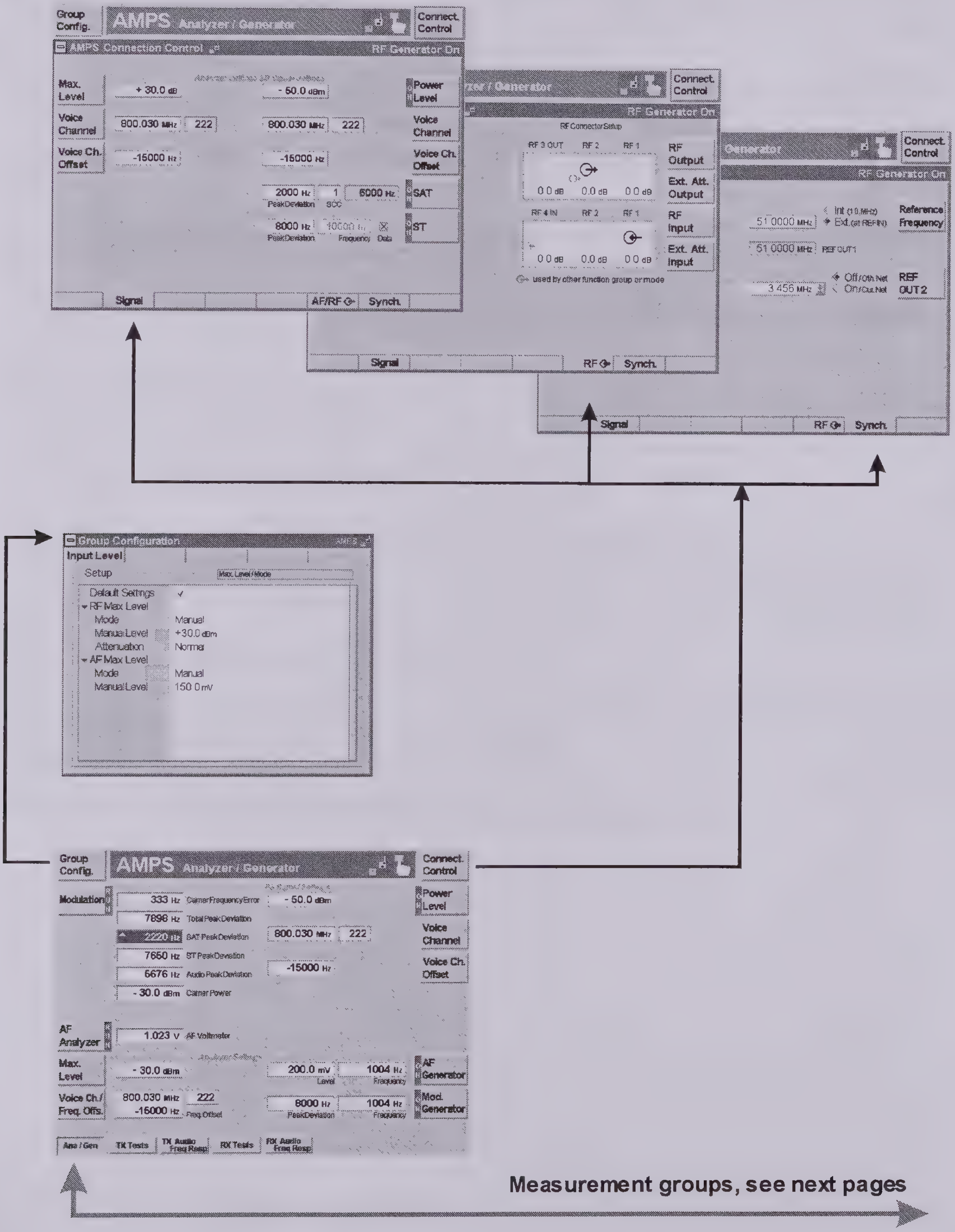
A *stop condition* can be set for most measurements:

None	The measurement is performed according to its repetition mode, irrespective of the measurement results and the limits set.
On Limit Failure	the measurement is stopped as soon as one of the limits is exceeded, irrespective of the repetition mode set. If no limit failure occurs, it is performed according to its repetition mode.

The *stop condition* is set in the *Control* tab of the configuration popup-menus assigned to the measurement groups.

Menu Overview

AMPS Non Signalling – General Configurations



Max. Level: + 30.0 dB
Voice Channel: 800.030 MHz 222
Voice Ch. Offset: -15000 Hz
Power Level: - 50.0 dBm
Voice Channel: 800.030 MHz 222
Voice Ch. Offset: -15000 Hz
SAT: 2000 Hz PeakDeviation, 1 SCC, 6000 Hz
ST: 8000 Hz PeakDeviation, 10000 Hz Frequency, ☒ Data

RF Output: 0.0 dB 0.0 dB 0.0 dB
RF Input: 0.0 dB 0.0 dB 0.0 dB
used by other function group or mode

Reference Frequency: 51.0000 MHz ○ Int (10 MHz) ● Ext. (at REF IN)
51.0000 MHz REF OUT1
REF OUT2: 3.456 MHz ● Off/Oth.Net ○ On/Cu.Net

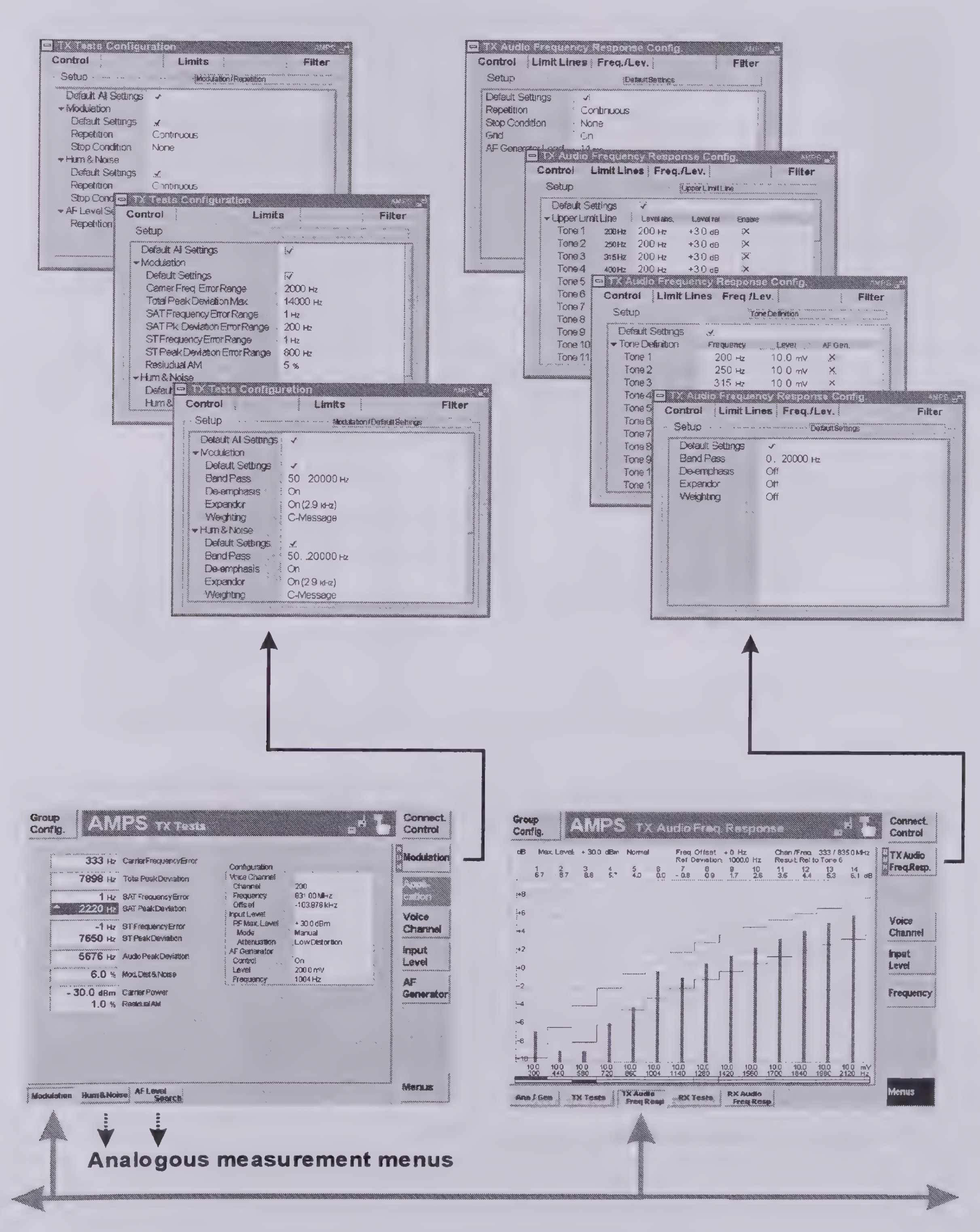
Default Settings ✓
RF Max Level
- Mode: Manual
- Manual Level: +30.0 dBm
- Attenuation: Normal

AF Max Level
- Mode: Manual
- Manual Level: 150.0 mV

333 Hz Carrier Frequency Error
7898 Hz Total Peak Deviation
2220 Hz SAT Peak Deviation
7650 Hz ST Peak Deviation
6676 Hz Audio Peak Deviation
- 30.0 dBm Carrier Power
Power Level: - 50.0 dBm
Voice Channel: 800.030 MHz 222
Voice Ch. Offset: -15000 Hz
AF Analyzer: 1.023 V AF Voltmeter
Max. Level: - 30.0 dBm
Voice Ch./Freq. Offs.: 800.030 MHz 222, -15000 Hz Freq.Offset
AF Generator: 200.0 mV Level, 1004 Hz Frequency
Mod. Generator: 8000 Hz PeakDeviation, 1004 Hz Frequency

Measurement groups, see next pages

AMPS Non Signalling – TX Tests and TX Audio Freq. Response



TX Tests Configuration – Setup (Modulation / Repetition)

Default All Settings ✓
Modulation
Default Settings ✓
Repetition Continuous
Stop Condition None
Hum & Noise
Default Settings ✓
Repetition Continuous
AF Level Search
Repetition

TX Tests Configuration – Limits

Default All Settings ✓
Modulation
Default Settings ✓
Carrier Freq. Error Range 2000 Hz
Total Peak Deviation Max 14000 Hz
SAT Frequency Error Range 1 Hz
SAT Pk. Deviation Error Range 200 Hz
ST Frequency Error Range 1 Hz
ST Peak Deviation Error Range 800 Hz
Residual AM 5 %
Hum & Noise

TX Tests Configuration – Filter (Modulation / Default Settings)

Default All Settings ✓
Modulation
Default Settings ✓
Band Pass 50 .. 20000 Hz
De-emphasis On
Expandor On (2.9 kHz)
Weighting C-Message
Hum & Noise
Default Settings ✓
Band Pass 50 .. 20000 Hz
De-emphasis On
Expandor On (2.9 kHz)
Weighting C-Message

TX Audio Frequency Response Config. – Control (Default Settings)

Default Settings ✓
Repetition Continuous
Stop Condition None
Grid On
AF Generator Level

TX Audio Frequency Response Config. – Limit Lines (Upper Limit Line)

Default Settings ✓
Upper Limit Line — Level abs. — Level rel. — Enable
Tone 1 200 Hz 200 Hz +3.0 dB ☒
Tone 2 250 Hz 200 Hz +3.0 dB ☒
Tone 3 315 Hz 200 Hz +3.0 dB ☒
Tone 4 400 Hz 200 Hz +3.0 dB ☒
Tone 5
Tone 6
Tone 7
Tone 8
Tone 9
Tone 10
Tone 11

TX Audio Frequency Response Config. – Freq./Lev. (Tone Definition)

Default Settings ✓
Tone Definition — Frequency — Level — AF Gen.
Tone 1 200 Hz 10.0 mV ☒
Tone 2 250 Hz 10.0 mV ☒
Tone 3 315 Hz 10.0 mV ☒
Tone 4
Tone 5
Tone 6
Tone 7
Tone 8
Tone 9
Tone 1
Tone 1

TX Audio Frequency Response Config. – Filter (Default Settings)

Default Settings ✓
Band Pass 0 .. 20000 Hz
De-emphasis Off
Expandor Off
Weighting Off

AMPS TX Tests

333 Hz Carrier Frequency Error
7898 Hz Total Peak Deviation
1 Hz SAT Frequency Error
2220 Hz SAT Peak Deviation
-1 Hz ST Frequency Error
7650 Hz ST Peak Deviation
5676 Hz Audio Peak Deviation
6.0 % Mod.Dist & Noise
- 30.0 dBm Carrier Power
1.0 % Residual AM

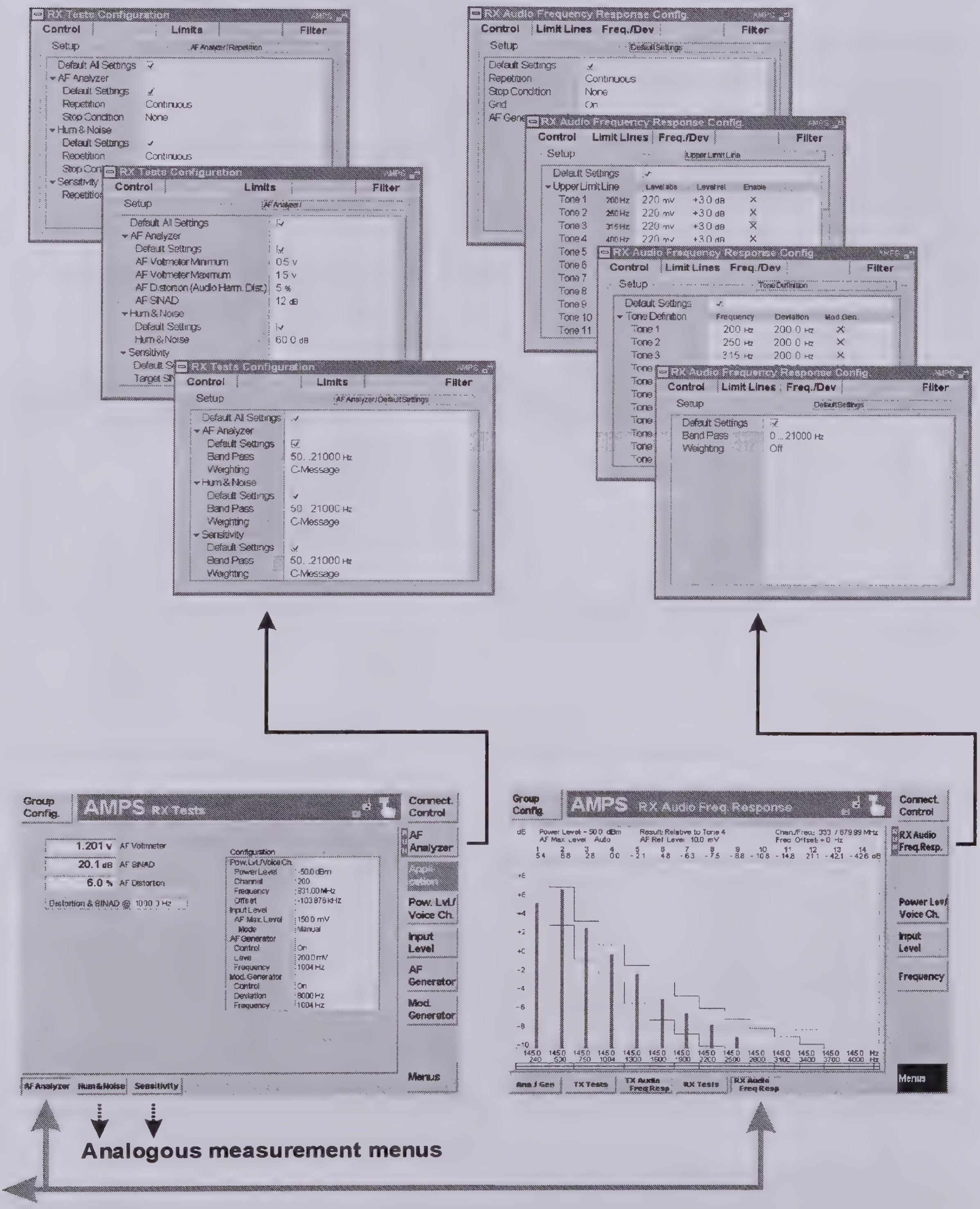
Configuration
Voice Channel
Channel 200
Frequency 831.00 MHz
Offset -103.876 kHz
Input Level
RF Max. Level + 30.0 dBm
Mode Manual
Attenuation Low Distortion
AF Generator
Control On
Level 200.0 mV
Frequency 1004 Hz

AMPS TX Audio Freq Response

dB Max. Level: + 30.0 dBm Normal
Freq. Offset: + 0 Hz
Ref. Deviation: 1000.0 Hz
Chan./Freq. 333 / 835.0 MHz
Result: Rel. to Tone 6

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
dB	6.7	8.7	8.8	5.7	4.0	0.0	- 0.8	0.9	1.7	2.6	3.6	4.4	5.3	6.1	dB
mV	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	mV
Hz	300	440	580	720	860	1004	1140	1280	1420	1560	1700	1840	1980	2120	Hz

AMPS Non Signalling – RX Tests and RX Audio Freq. Response



RX Tests Configuration – Control, Setup: AF Analyzer/Repetition

Default All Settings ✓
AF Analyzer
Default Settings ✓
Repetition: Continuous
Stop Condition: None
Hum & Noise
Default Settings ✓
Repetition: Continuous
Stop Con…
Sensitivity
Repetitio…

RX Tests Configuration – Limits, Setup: AF Analyzer/

Default All Settings ☑
AF Analyzer
Default Settings ☑
AF Voltmeter Minimum: 0.5 V
AF Voltmeter Maximum: 1.5 V
AF Distortion (Audio Harm. Dist.): 5 %
AF SINAD: 12 dB
Hum & Noise
Default Settings ☑
Hum & Noise: 60.0 dB
Sensitivity
Default S…
Target SI…

RX Tests Configuration – Filter, Setup: AF Analyzer/Default Settings

Default All Settings ✓
AF Analyzer
Default Settings ☑
Band Pass: 50...21000 Hz
Weighting: C-Message
Hum & Noise
Default Settings ✓
Band Pass: 50...21000 Hz
Weighting: C-Message
Sensitivity
Default Settings ✓
Band Pass: 50...21000 Hz
Weighting: C-Message

RX Audio Frequency Response Config – Control, Setup: Default Settings

Default Settings ✓
Repetition: Continuous
Stop Condition: None
Grid: On
AF Gen…

RX Audio Frequency Response Config – Limit Lines, Setup: Upper Limit Line

Default Settings ✓

Upper Limit Line		Level abs	Level rel	Enable
Tone 1	200 Hz	220 mV	+3.0 dB	✕
Tone 2	250 Hz	220 mV	+3.0 dB	✕
Tone 3	315 Hz	220 mV	+3.0 dB	✕
Tone 4	400 Hz	220 mV	+3.0 dB	✕
Tone 5				
Tone 6				
Tone 7				
Tone 8				
Tone 9				
Tone 10				
Tone 11				

RX Audio Frequency Response Config – Freq./Dev, Setup: Tone Definition

Default Settings ✓

Tone Definition	Frequency	Deviation	Mod Gen.
Tone 1	200 Hz	200.0 Hz	✕
Tone 2	250 Hz	200.0 Hz	✕
Tone 3	315 Hz	200.0 Hz	✕

RX Audio Frequency Response Config – Filter, Setup: Default Settings

Default Settings ☑
Band Pass: 0...21000 Hz
Weighting: Off

AMPS RX Tests

1.201 V AF Voltmeter
20.1 dB AF SINAD
6.0 % AF Distortion
Distortion & SINAD @ 1000.0 Hz

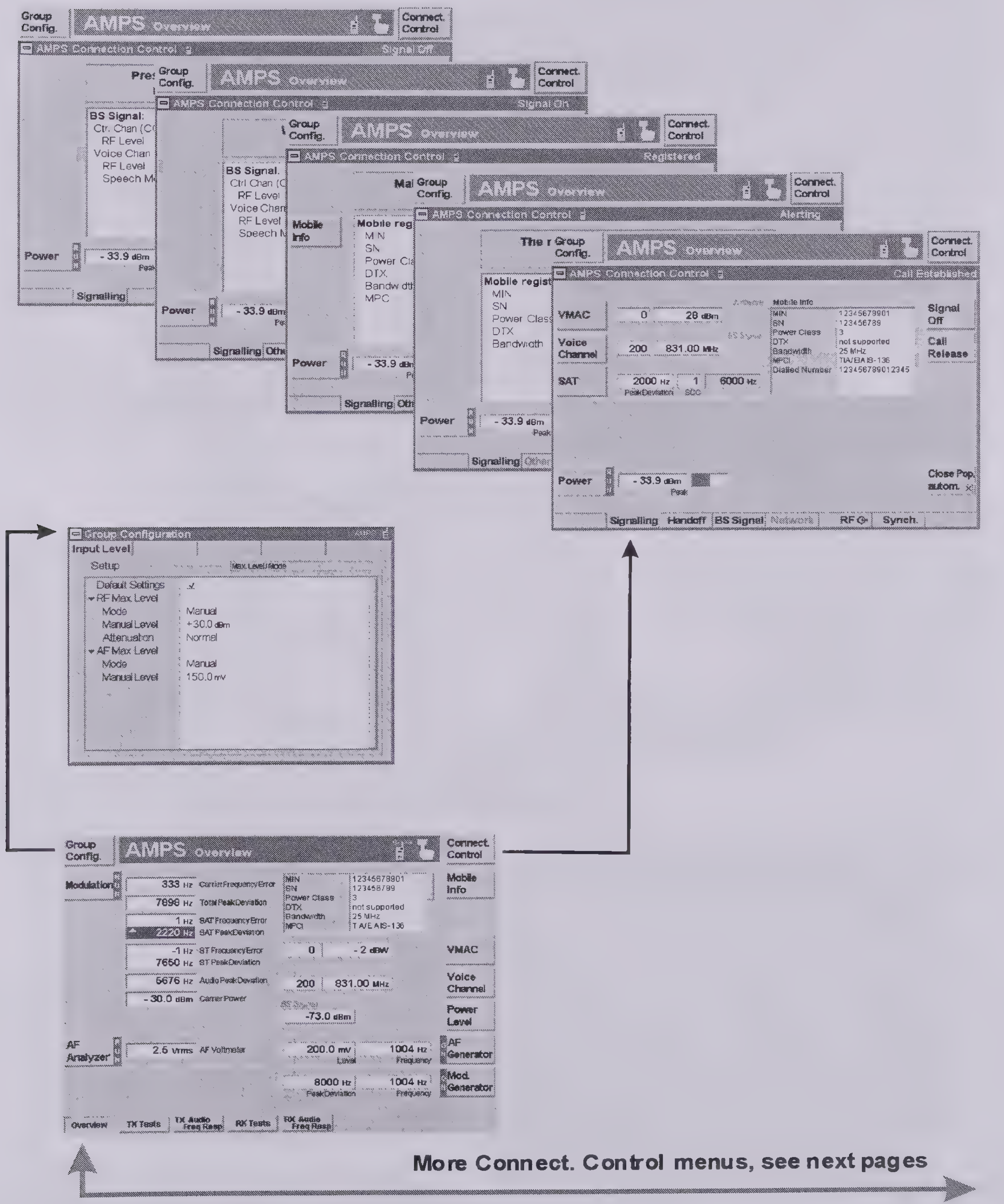
Configuration
Pow. Lvl./Voice Ch.
Power Level: -50.0 dBm
Channel: 200
Frequency: 831.00 MHz
Offset: -103.876 kHz
Input Level
AF Max. Level: 150.0 mV
Mode: Manual
AF Generator
Control: On
Level: 200.0 mV
Frequency: 1004 Hz
Mod. Generator
Control: On
Deviation: 8000 Hz
Frequency: 1004 Hz

AMPS RX Audio Freq. Response

Power Level -50.0 dBm
AF Max. Level Auto
Result: Relative to Tone 4
AF Ref Level 10.0 mV
Chan./Freq.: 333 / 879.99 MHz
Freq. Offset: +0 Hz

Analogous measurement menus

AMPS Signalling – General Configurations I



AMPS Connection Control – Call Established

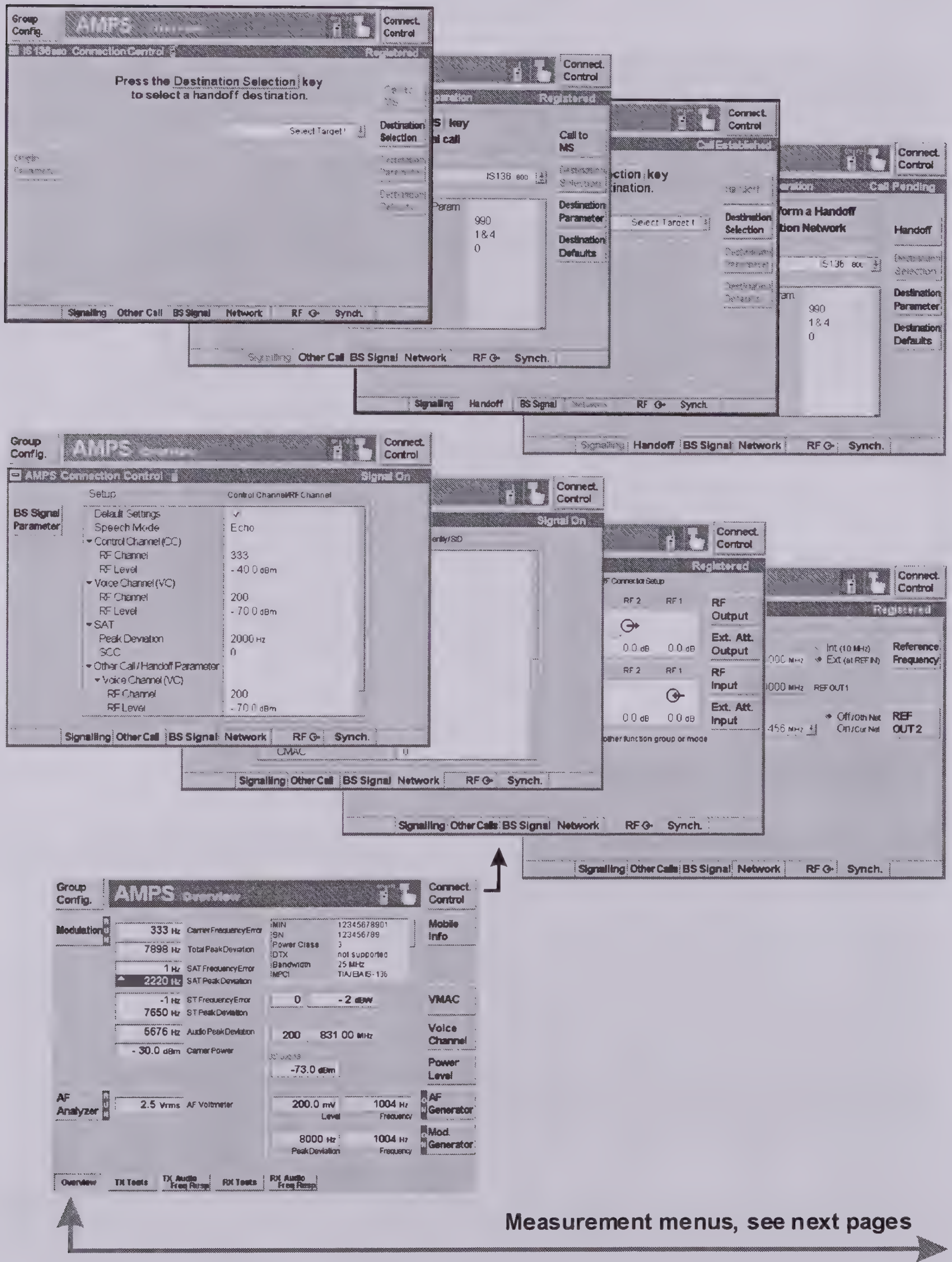
VMAC: 0, 28 dBm
Voice Channel: 200, 831.00 MHz
SAT: 2000 Hz PeakDeviation, 1 SCC, 6000 Hz
Power: - 33.9 dBm Peak

Mobile Info
MIN 12345678901
SN 123456789
Power Class 3
DTX not supported
Bandwidth 25 MHz
MPCI TIA/EIA IS-136
Dialed Number 123456789012345

Group Configuration – Input Level, Setup
Default Settings ✓
RF Max Level
Mode Manual
Manual Level +30.0 dBm
Attenuation Normal
AF Max Level
Mode Manual
Manual Level 150.0 mV

AMPS Overview
Modulation:
333 Hz Carrier Frequency Error
7898 Hz Total Peak Deviation
1 Hz SAT Frequency Error
2220 Hz SAT Peak Deviation
-1 Hz ST Frequency Error
7650 Hz ST Peak Deviation
5676 Hz Audio Peak Deviation
- 30.0 dBm Carrier Power
AF Analyzer: 2.5 Vrms AF Voltmeter
MIN 12345678901
SN 123456789
Power Class 3
DTX not supported
Bandwidth 25 MHz
MPCI TIA/EIA IS-136
VMAC: 0, - 2 dBW
Voice Channel: 200, 831.00 MHz
Power Level: -73.0 dBm
AF Generator: 200.0 mV Level, 1004 Hz Frequency
Mod. Generator: 8000 Hz PeakDeviation, 1004 Hz Frequency

AMPS Signalling – General Configurations II



Setup	Control Channel/RF Channel
Default Settings	✓
Speech Mode	Echo
▾ Control Channel (CC)	
RF Channel	333
RF Level	-40.0 dBm
▾ Voice Channel (VC)	
RF Channel	200
RF Level	-70.0 dBm
▾ SAT	
Peak Deviation	2000 Hz
SCC	0
▾ Other Call / Handoff Parameter	
▾ Voice Channel (VC)	
RF Channel	200
RF Level	-70.0 dBm

RF 2	RF 1
0.0 dB	0.0 dB
0.0 dB	0.0 dB

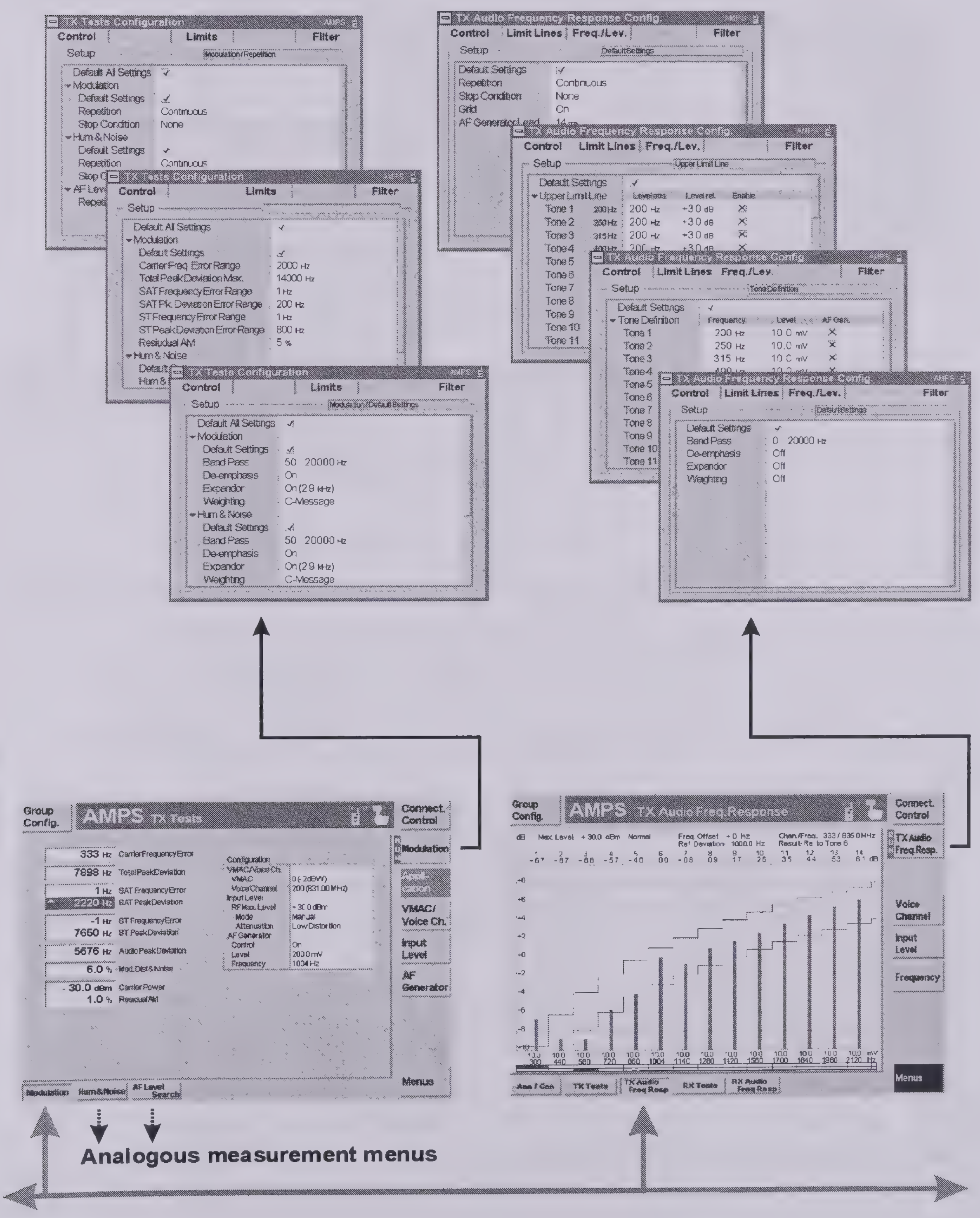
Int (10 MHz)
Ext (at REF IN)
Off / Oth Net
On / Cur Net

Value	Measurement
333 Hz	Carrier Frequency Error
7898 Hz	Total Peak Deviation
1 Hz	SAT Frequency Error
2220 Hz	SAT Peak Deviation
-1 Hz	ST Frequency Error
7650 Hz	ST Peak Deviation
5676 Hz	Audio Peak Deviation
-30.0 dBm	Carrier Power
2.5 Vrms	AF Voltmeter

MIN	12345678901
SN	123456789
Power Class	3
DTX	not supported
Bandwidth	25 MHz
MPCI	TIA/EIA IS-136

VMAC: 0, -2 dBW
Voice Channel: 200, 831.00 MHz
Power Level: -73.0 dBm
AF Generator: 200.0 mV Level, 1004 Hz Frequency
Mod. Generator: 8000 Hz Peak Deviation, 1004 Hz Frequency

AMPS Signalling – TX Tests and TX Audio Freq. Response



TX Tests Configuration – Setup: Modulation/Repetition

Default All Settings	✓
Modulation	
Default Settings	✓
Repetition	Continuous
Stop Condition	None
Hum & Noise	
Default Settings	✓
Repetition	Continuous

TX Tests Configuration – Limits

Default All Settings	✓
Modulation	
Default Settings	✓
Carrier Freq. Error Range	2000 Hz
Total Peak Deviation Max.	14000 Hz
SAT Frequency Error Range	1 Hz
SAT Pk. Deviation Error Range	200 Hz
ST Frequency Error Range	1 Hz
ST Peak Deviation Error Range	800 Hz
Residual AM	5 %
Hum & Noise	

TX Tests Configuration – Setup: Modulation/Default Settings

Default All Settings	✓
Modulation	
Default Settings	✓
Band Pass	50 20000 Hz
De-emphasis	On
Expandor	On (2.9 kHz)
Weighting	C-Message
Hum & Noise	
Default Settings	✓
Band Pass	50 20000 Hz
De-emphasis	On
Expandor	On (2.9 kHz)
Weighting	C-Message

TX Audio Frequency Response Config. – Setup: Default Settings

Default Settings	✓
Repetition	Continuous
Stop Condition	None
Grid	On

TX Audio Frequency Response Config. – Setup: Upper Limit Line

Upper Limit Line		Level abs.	Level rel.	Enable
Default Settings		✓		
Tone 1	200 Hz	200 Hz	+3.0 dB	☒
Tone 2	250 Hz	200 Hz	+3.0 dB	☒
Tone 3	315 Hz	200 Hz	+3.0 dB	☒
Tone 4				
Tone 5				
Tone 6				
Tone 7				
Tone 8				
Tone 9				
Tone 10				
Tone 11				

TX Audio Frequency Response Config. – Setup: Tone Definition

Tone Definition	Frequency	Level	AF Gen.
Default Settings	✓		
Tone 1	200 Hz	10.0 mV	☒
Tone 2	250 Hz	10.0 mV	☒
Tone 3	315 Hz	10.0 mV	☒
Tone 4			
Tone 5			
Tone 6			
Tone 7			
Tone 8			
Tone 9			
Tone 10			
Tone 11			

TX Audio Frequency Response Config. – Setup: Default Settings

Default Settings	✓
Band Pass	0 20000 Hz
De-emphasis	Off
Expandor	Off
Weighting	Off

AMPS TX Tests

333 Hz	Carrier Frequency Error
7898 Hz	Total Peak Deviation
1 Hz	SAT Frequency Error
2220 Hz	SAT Peak Deviation
-1 Hz	ST Frequency Error
7650 Hz	ST Peak Deviation
5676 Hz	Audio Peak Deviation
6.0 %	Mod. Dist.& Noise
- 30.0 dBm	Carrier Power
1.0 %	Residual AM

Configuration	
VMAC/Voice Ch.	
VMAC	0 (- 2dBW)
Voice Channel	200 (831.00 MHz)
Input Level	
RF Max. Level	+ 30.0 dBm
Mode	Manual
Attenuation	Low Distortion
AF Generator	
Control	On
Level	200.0 mV
Frequency	1004 Hz

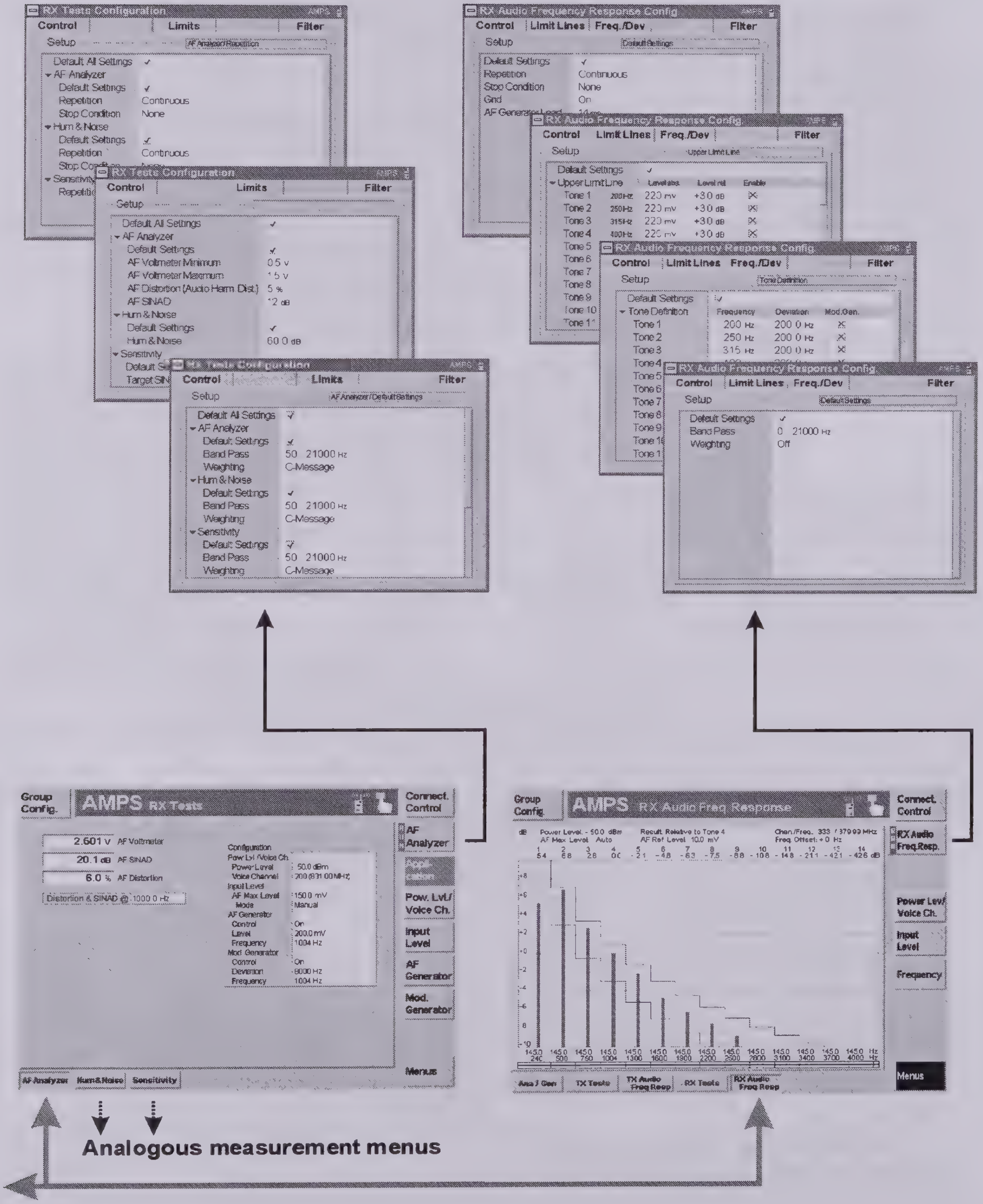
AMPS TX Audio Freq.Response

dB Max. Level + 30.0 dBm Normal Freq. Offset + 0 Hz Ref. Deviation: 1000.0 Hz Chan./Freq. 333 / 835.0 MHz Result: Rel. to Tone 6

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
-6.7	-6.7	-6.8	-5.7	-4.0	0.0	-0.6	0.9	1.7	2.6	3.5	4.4	5.3	6.1	dB
10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	mV
300	440	580	720	860	1004	1140	1280	1420	1560	1700	1840	1980	2120	Hz

Analogous measurement menus

AMPS Signalling – RX Tests and RX Audio Freq. Response



RX Tests Configuration – Setup: AF Analyzer/Repetition

Default All Settings ✓
AF Analyzer
Default Settings ✓
Repetition Continuous
Stop Condition None
Hum & Noise
Default Settings ✓
Repetition Continuous
Stop Condition
Sensitivity
Repetition

RX Tests Configuration – Limits

Default All Settings ✓
AF Analyzer
Default Settings ✓
AF Voltmeter Minimum 0.5 V
AF Voltmeter Maximum 1.5 V
AF Distortion (Audio Harm. Dist.) 5 %
AF SINAD 12 dB
Hum & Noise
Default Settings ✓
Hum & Noise 60.0 dB
Sensitivity
Default Settings
Target SINAD

RX Tests Configuration – Filter – Setup: AF Analyzer/Default Settings

Default All Settings ✓
AF Analyzer
Default Settings ✓
Band Pass 50 21000 Hz
Weighting C-Message
Hum & Noise
Default Settings ✓
Band Pass 50 21000 Hz
Weighting C-Message
Sensitivity
Default Settings ✓
Band Pass 50 21000 Hz
Weighting C-Message

RX Audio Frequency Response Config – Control – Setup: Default Settings

Default Settings ✓
Repetition Continuous
Stop Condition None
Gnd On
AF Generator Load

RX Audio Frequency Response Config – Limit Lines – Setup: Upper Limit Line

Default Settings ✓

Upper Limit Line		Level abs.	Level rel.	Enable
Tone 1	200 Hz	220 mV	+3.0 dB	☒
Tone 2	250 Hz	220 mV	+3.0 dB	☒
Tone 3	315 Hz	220 mV	+3.0 dB	☒
Tone 4	400 Hz	220 mV	+3.0 dB	☒
Tone 5				
Tone 6				
Tone 7				
Tone 8				
Tone 9				
Tone 10				
Tone 11				

RX Audio Frequency Response Config – Freq./Dev – Setup: Tone Definition

Default Settings ✓

Tone Definition	Frequency	Deviation	Mod.Gen.
Tone 1	200 Hz	200.0 Hz	☒
Tone 2	250 Hz	200.0 Hz	☒
Tone 3	315 Hz	200.0 Hz	☒
Tone 4			
Tone 5			
Tone 6			
Tone 7			
Tone 8			
Tone 9			
Tone 10			
Tone 11			

RX Audio Frequency Response Config – Filter – Setup: Default Settings

Default Settings ✓
Band Pass 0 21000 Hz
Weighting Off

AMPS RX Tests

2.601 V AF Voltmeter
20.1 dB AF SINAD
6.0 % AF Distortion
Distortion & SINAD @ 1000.0 Hz

Configuration
Pow Lvl /Voice Ch.
Power Level : 50.0 dBm
Voice Channel : 700 (831.00 MHz)
Input Level
AF Max Level : 150.0 mV
Mode : Manual
AF Generator
Control : On
Level : 200.0 mV
Frequency : 1004 Hz
Mod. Generator
Control : On
Deviation : 8000 Hz
Frequency : 1004 Hz

AMPS RX Audio Freq Response

dB Power Level - 50.0 dBm Result Relative to Tone 4 Chan./Freq. 333 / 379.99 MHz
AF Max Level Auto AF Ref Level 10.0 mV Freq. Offset: + 0 Hz

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
5.4	6.8	2.8	0.0	-2.1	-4.8	-6.3	-7.5	-8.8	-10.8	-14.8	-21.1	-42.1	-42.6	dB
145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	Hz
240	500	750	1004	1300	1600	1900	2200	2500	2800	3100	3400	3700	4000	Hz

Contents

4 Functions and their Application 4.1

AMPS Module Tests (Non Signalling) **4.2**
Measurement Menu Analyzer/Generator 4.2
TX Tests 4.4
Measurement Menu (TX Tests) 4.5
Test Settings 4.6
Measurement Results 4.8
Measurement Configurations (TX Tests Configuration) 4.10
Measurement Control (TX Tests Configuration – Control) 4.10
Limits (TX Tests Configuration – Limits) 4.12
Path Configuration (TX Tests Configuration – Filter) 4.13
TX Audio Freq. Response 4.16
Measurement Menu (TX Audio Freq. Response) 4.16
Test Settings 4.17
Measurement Results 4.19
Measurement Configurations (*TX Audio Freq. Response* Configuration) 4.20
Measurement Control (TX Audio Freq. Response Configuration – Control) .. 4.20
Limit Lines (TX Audio Freq. Response Configuration – Limit Lines) 4.21
Test Tones (*TX Audio Freq. Response* Configuration – Freq./Level) 4.22
Path Configuration (*TX Audio Freq. Response* Configuration – Filter) 4.23
RX Tests 4.24
Measurement Menu (RX Tests) 4.25
Test Settings 4.25
Measurement Results 4.28
Measurement Configurations (RX Tests Configuration) 4.29
Measurement Control (RX Tests Configuration – Control) 4.30
Limits (RX Tests Configuration – Limits) 4.31
Path Configuration (RX Tests Configuration – Filter) 4.32
RX Audio Freq. Response 4.33
Measurement Menu (*RX* Audio Freq. Response) 4.33
Test Settings 4.34
Measurement Results 4.35
Measurement Configurations (*RX Audio Freq. Response* Configuration) 4.37
Measurement Control (RX Audio Freq. Response Configuration – Control) .. 4.37
Limit Lines (RX Audio Freq. Response Configuration – Limit Lines) 4.37
Test Tones (*RX Audio Freq. Response* Configuration – Freq./Dev.) 4.37
Path Configuration (*RX Audio Freq. Response* Configuration – Filter) 4.37
Connection Control 4.38
Control of Input and Output Signals (Connection Control – Signal) 4.38
Panel Analyzer Settings 4.39
Panel BS Signal Settings 4.40
SAT and ST 4.42
AF/RF Connectors (Connection Control – Connector/Ext. Att.) 4.44
Reference Frequency (Connection Control – Synch.) 4.46
Group Configuration 4.48
Input Level (Group Configuration – Input Level) 4.48

AMPS Mobile Tests (Signalling Mode) ... 4.50
- Call Setup ... 4.50
  - Signalling Control without Signal (State Signal Off) ... 4.51
  - Signalling Control with Signal (State Signal On) ... 4.54
- Overview of the Function Group ... 4.56
- TX Tests ... 4.58
- TX Audio Freq. Response ... 4.60
- RX Tests ... 4.61
- RX Audio Freq. Response ... 4.62
- Connection Control (Contd.) ... 4.63
  - Signalling Control in the Registered State ... 4.63
  - Signalling Control in the Alerting State ... 4.65
  - Signalling Control with Call Established ... 4.66
  - Call to Another Network (Connection Control – Other Call) ... 4.68
  - Handoff to another Network (Connection Control – Handoff) ... 4.70
  - Signals of the CMU (Connection Control – BS Signal) ... 4.72
    - Signal Parameters (States Signal Off/On, *Registered*) ... 4.72
    - Signal Parameters (State Call Established) ... 4.74
  - Network Parameters (Connection Control – Network) ... 4.74
  - RF Connectors (Connection Control – Connector/Ext. Att.) ... 4.77
  - Reference Frequency (Connection Control – Synch.) ... 4.77
- Group Configuration ... 4.78
  - Input Level (Group Configuration – Input Level) ... 4.78

4 Functions and their Application

This chapter explains in detail all functions for the measurement of AMPS mobile stations.

It is divided into two sections describing the following test modes:

1. Analog AMPS module tests *(AMPS-MS Non Signalling)*
2. Analog AMPS mobile tests *(AMPS-MS Signalling)*

This reference chapter is organized according to the provided measurements and configurations (see graphical overview at the end of chapter 3). In contrast to chapter 6, *Remote Control – Commands,* general measurement configurations are relegated to the end of each section. The description of each softkey, select or input field is followed by the corresponding remote-control commands. Similarly, the description of the commands in chapter 6 also contains the corresponding menus of the user interface.

Each menu and each panel is briefly described first and then illustrated together with its call button. The menu functions are explained in the following way:

Softkey	Short function definition	
Designation of select/input field	Definition of field function. Further description of the field: purpose, interaction with other settings, notes...	
	Parameter 1	Description of parameter 1
	Parameter 2	Description of parameter 2
	...	
	Further description of the parameters: purpose, interaction with other settings, notes...	
Remote control	`Remote-control command (long form)  Parameter1 | Parameter2` `...`	

For all numerical values, including their ranges and default settings, please refer to the description of the remote-control commands in chapter 6.

The description of the operating concept is to be found in chapter 3 of the operating manual for the CMU basic instrument; besides, a description of measurement control and the essential settings and an overview of the most important menus is given at the end of chapter 3 in the present AMPS manual. A comprehensive index listing important keywords and the proper names of all menus, dialog elements and softkeys is appended to the end of this manual.

AMPS Module Tests (Non Signalling)

This section provides detailed information on the measurement and configuration menus defined in function groups *AMPS-MS Non Signalling*. It is organized like a typical measurement session including the following stages::

1. General settings *(Analyzer/Generator)* and display of generator signals
2. Measurement menus *(TX Tests, TX Audio Freq. Response, RX Tests, RX Audio Freq. Response):* performance of the measurements, output of measurement results, specific measurement configurations
3. Global configurations *(Group Configuration, Connection Control)*

Measurement Menu Analyzer/Generator

The main menu *Analyzer/Generator* configures the RF and AF generator signals and the signals received and analyzed by the CMU.

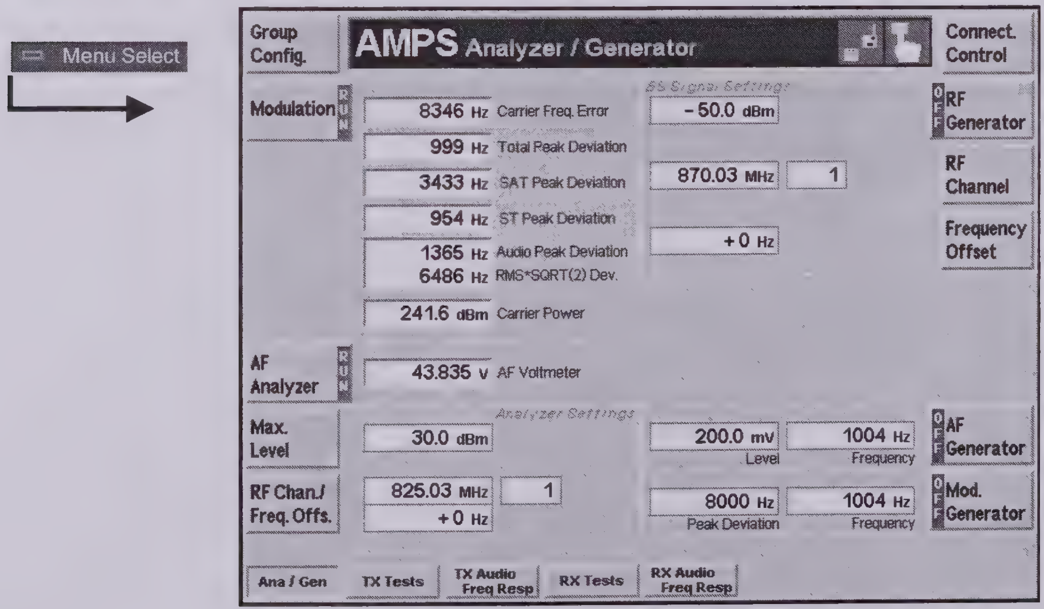
The layout and function of the following two panels for signal configuration are identical with the panels that constitute the popup menu *Signal* in the menu group *Connection Control*:

Panel Analyzer Settings	RF analyzer control	See page 4.39
Panel BS Signal Settings	RF generator control	See page 4.40

The remaining softkeys indicate various measurement results and control the AF and modulation frequency generators:

Modulation	Results of the *TX Modulation* measurement (see p. 4.8 ff.)
AF Voltmeter	Result of the audio voltage measurement
AF Generator/Mod. Generator	AF and modulation generator control

The main menu *Analyzer/Generator* can be opened from the main menu *Menu Select* (with associated key at the front of instrument). It is linked with the remaining measurement menus of the function group *AMPS-MS Non Signalling Mode* via the hotkeys.



8346 Hz Carrier Freq. Error
999 Hz Total Peak Deviation
3433 Hz SAT Peak Deviation
954 Hz ST Peak Deviation
1365 Hz Audio Peak Deviation
6486 Hz RMS*SQRT(2) Dev.
241.6 dBm Carrier Power
43.835 V AF Voltmeter

BS Signal Settings
-50.0 dBm
870.03 MHz 1
+0 Hz

Analyzer Settings
30.0 dBm
825.03 MHz 1
+0 Hz

200.0 mV Level
1004 Hz Frequency
8000 Hz Peak Deviation
1004 Hz Frequency

Fig. 4-1 Measurement menu Analyzer / Generator

AF Analyzer

The *AF Analyzer* softkey controls the audio measurement and indicates its status *(RUN / HLT / OFF)*.

This status can be changed by means of the *ON/OFF* key or the *CONT/HALT* key while the softkey is selected (press once). While the measurement is running, the RMS voltage measured is indicated and continuously updated in an output field.

The AF signal is fed in via the input connector *AF IN* at the front panel of the CMU.

Pressing the selected *AF Analyzer* softkey for a second time calls up the *Control* tab of the popup menu *RX Tests Configuration* (see page 4.30) providing configuration settings for the audio measurement. The *RX Tests Configuration* menu can be closed on pressing *AF Analyzer* for a third time.

Remote control

`INITiate:RXTests:AFANalyzer; STOP:RXTests:AFANalyzer`
`ABORt:RXTests:AFANalyzer; CONTinue:RXTests:AFANalyzer`

`FETCh:RXTests:AFANalyzer:STATus?`

`READ[:SCALar]:RXTests:AFANalyzer[:RESult]?` etc.

AF Generator

The *AF Generator* softkey controls the audio generator *(ON / OFF)* and indicates its status.

The generator can be switched on or off by means of the *ON/OFF* key while the softkey is selected (press once). The parameters determining the generated sinusoidal audio signal can be set in two input fields:

Level	Effective (RMS averaged) voltage of the AF signal
Frequency	Frequency of the AF signal

The AF signal is applied to the output connector *AF OUT* at the front panel of the CMU. In contrast, the audio signal to be modulated onto the RF voice signal is configured via the *Mod. Generator* softkey; see below.

Remote control

`INITiate:AFGenerator; ABORt:AFGenerator`

`FETCh:AFGenerator:STATus?`

`SOURce:AFGenerator:LEVel <Level>`
`SOURce:AFGenerator:FREQuency <Frequency>`

Mod. Generator

The *Mod. Generator* softkey controls the modulation frequency generator and indicates its status *(ON / OFF)*.

The generator can be switched on or off by means of the *ON/OFF* key while the softkey is selected (press once). The modulation signal generated is a sinusoidal test tone modulating the base station carrier (i.e. the RF *BS Signal* transmitted by the CMU, applied to the *RF Output* connectors selected in the *Connection Control – AF/RF Connector* menu, see p. 4.44). Its parameters can be set in two input fields:

Peak deviation	Peak frequency deviation used to transmit the modulation signal
Frequency	Frequency of the modulation signal

The AF signal applied to the output connector *AF OUT* at the front panel of the CMU is configured via the *AF Generator* softkey, see above.

Remote control

`INITiate:MODGenerator; ABORt:MODGenerator`

`FETCh:MODGenerator:STATus?` etc.

`SOURce:MODGenerator:LEVel <Level>`
`SOURce:MODGenerator:FREQuency <Frequency>`

TX Tests

The menu group *TX Tests* comprises the measurement of parameters characterizing the transmitter quality of the mobile phone. The measurement results are displayed in the measurement menu *TX Tests,* the popup menu *TX Tests Configuration* is used for configuration of the measurements.

Quantities characterizing the mobile phone transmitter quality are determined as follows:

The mobile is connected to the CMU via one of the bidirectional RF connectors and the AF output as shown in Fig. 4-2. With this test setup, the CMU represents a signal source providing an audio signal (signal output *AF OUT)* and the RF voice carrier transmitted via one of the RF connectors which can be modulated with the SAT and the ST, if so desired. To obtain the measured quantities, the CMU demodulates and analyzes the RF output signal of the mobile phone transmitter. The signals are configured in the *Analyzer/Generator* (see p. 4.2) and the *Connection Control* menu (see p. 4.38).

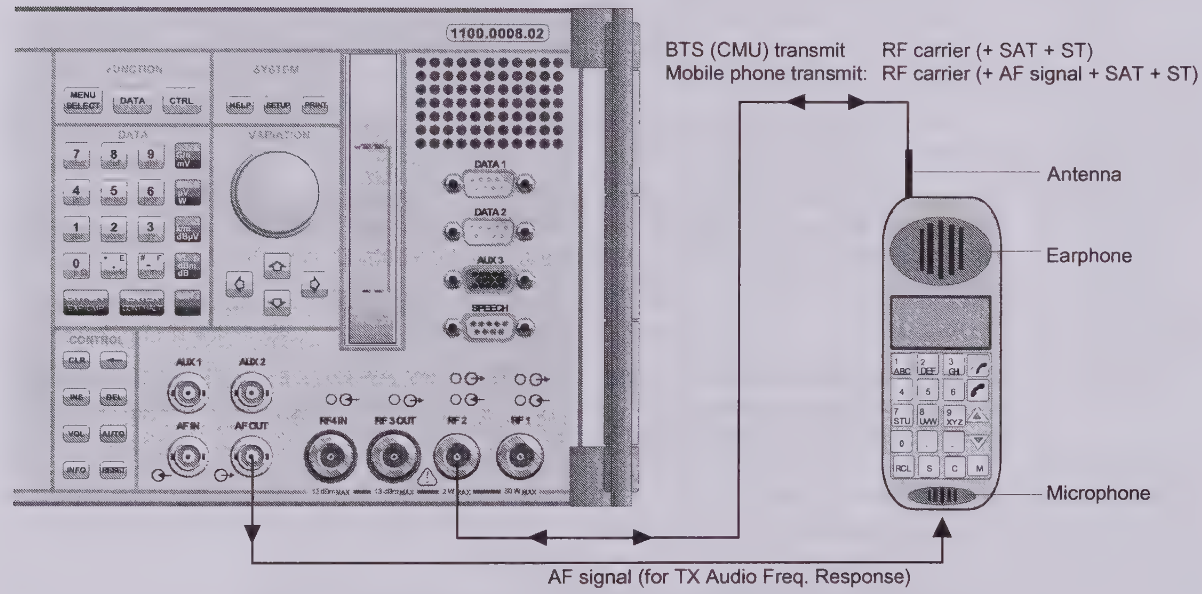


Fig. 4-2 Test setup for TX Tests

The standard describes various quantities to be measured and specifies the minimum requirements and the method of measurement for each quantity. The measurement group is divided into three independent menus corresponding to different configuration data sets and different results (applications *Modulation, Hum & Noise, AF Level Search),* which are explained in more detail in section *Measurement Results* on page 4.8 ff.

Note that the CMU analyzer functions as a standard test receiver with several switchable voice-processing stages. This equipment can be configured in the *Filter* tab of the *TX Tests Configuration* menu (see p. 4.13) to meet the requirements for the different methods of measurement described in the standard.

Measurement Menu (TX Tests)

The measurement menu *TX Tests* shows the results of the transmitter tests.

- The main softkey *Modulation* (which changes to *Hum & Noise* and *AF Level Search* if one of these applications is selected) indicates the status of the *TX Tests (RUN | HLT | OFF)* and opens the configuration menu *TX Tests Config* (press twice).
- The other softkeys to the right of the test diagram are combined with various hotkeys (e.g. the hotkeys *Voice Channel, Frequency,* and *Offset* belong to the softkey *Voice Channel).* If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates the current setting and enables an entry.

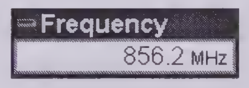
Example:

Frequency

The *Frequency* softkey displays a hotkey bar including the hotkey *Frequency*.

Frequency

The *Frequency* hotkey opens the input window *Frequency*.

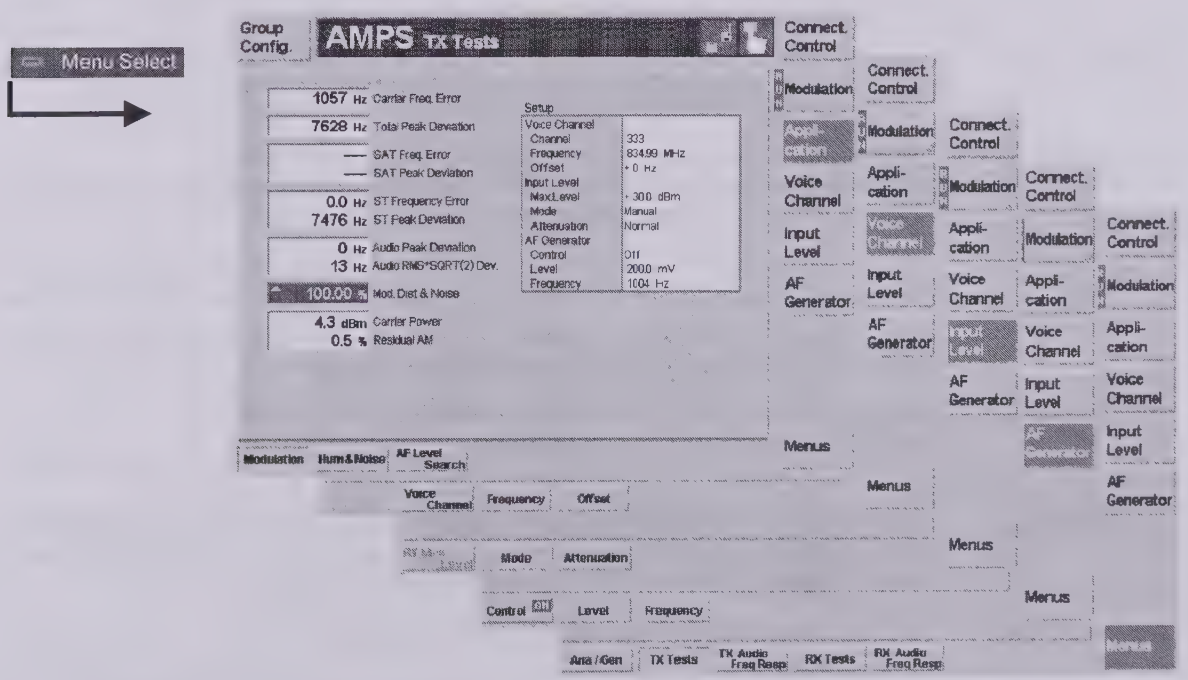


Frequency
856.2 MHz

Input windows indicate the current parameter value (in this case: the frequency of the ongoing measurement) or a list of the possible settings. Parameters are changed by

- Overwriting/incrementing numerical values (for numeric parameters)
- Selecting from the list of parameters (for select parameters)

The measurement menu *TX Tests* is opened via the main menu *Menu Select* (with the associated key at the front of the instrument) or using the *TX Tests* hotkey.



1057 Hz Carrier Freq. Error
7628 Hz Total Peak Deviation
—— SAT Freq. Error
—— SAT Peak Deviation
0.0 Hz ST Frequency Error
7476 Hz ST Peak Deviation
0 Hz Audio Peak Deviation
13 Hz Audio RMS*SQRT(2) Dev.
100.00 % Mod. Dist & Noise
4.3 dBm Carrier Power
0.5 % Residual AM

Setup

Voice Channel	
Channel	333
Frequency	834.99 MHz
Offset	+ 0 Hz
Input Level	
Max.Level	+ 30.0 dBm
Mode	Manual
Attenuation	Normal
AF Generator	
Control	Off
Level	200.0 mV
Frequency	1004 Hz

Fig. 4-3 Measurement menu TX Tests

Test Settings

Application

The *Application* softkey activates the selection of the type of measurement to be performed and the measured quantities.

The results of the three alternative measurements (applications) are displayed in separate measurement menus. When an application is selected, the corresponding measurement menu is called up and the labeling of the main softkey controlling the measurement is adapted. The configuration settings for all applications, however, are listed in a common popup-menu (see p. 4.10 ff.).

Modulation

The *Modulation* hotkey activates the measurement of the modulation parameters.

In this mode, the frequency stability and deviation parameters related to the voice carrier, the SAT and ST (if available), and the audio signal plus the *Modulation Distortion & Noise* and the *Audio Peak Deviation*, are displayed; see p. 4.8 ff.

Remote control

No explicit switchover command. All *TX Tests – Modulation* measurements are identified by the 2nd/3rd level keywords `...TXTests:MODulation...`

Hum&Noise

The *Hum & Noise* hotkey activates the hum & noise measurement.

In this mode, parameters characterizing the voice carrier signal and the SAT plus the *Hum & Noise* are displayed; see p. 4.8 ff.

Remote control

No explicit switchover command. All *TX Tests – Hum & Noise* measurements are identified by the 2nd/3rd level keywords `...TXTests:HNOise...`

AF Level Search

The *AF Level Search* hotkey activates the measurement of the AF level corresponding to a definite audio peak deviation. The CMU performs repeated single shot measurements at varying AF signal levels until the *Target Audio Peak Deviation* (defined in the *Control* tab of the *TX Tests Configuration* menu, see p. 4.12 ff.) is found or a stop condition met.

Remote control

No explicit switchover command. All *TX Tests – AF Level Search* measurements are identified by the 2nd/3rd level keywords `...TXTests:AFLSearch...`

Voice Channel

The *Voice Channel* softkey configures the RF analyzer, in particular by setting the frequency of the RF voice channel measured.

Voice Channel

The *Voice Channel* hotkey defines the channel number of the RF voice signal to be analyzed. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.38.

Remote control

```
[SENSe:]RFANalyzer:FREQuency:UNIT CH
[SENSe:]RFANalyzer:FREQuency <CH_Number>
```

Frequency

The *Frequency* hotkey defines the signal frequency in MHz of the RF voice signal to be analyzed. See section *Control of Input and Output Signals (Connection Control – Signal)*, Panel *Analyzer Settings* on page 4.38.

Remote control

```
[SENSe:]RFANalyzer:FREQuency <Frequency>
```

Offset

The *Offset* hotkey defines the frequency offset of the RF voice signal to be analyzed. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.38.

Remote control `[SENSe:]RFANalyzer:FREQuency:OFFSet <Offset>`

Input Level

The *Input Level* softkey configures the RF input level.

Max. Level

The *Max. Level* hotkey determines the maximum expected RF input level in dBm.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]LEVel:MAXimum  <Level>`

Attenuation

The *Attenuation* hotkey selects a strategy for tuning the RF analyzer.

Normal	Input signal is kept unchanged
Low Noise	Enhanced mixer level. This setting ensures the full dynamic range of the CMU and is therefore recommended for power measurements.
Low Distortion	Decreased mixer level. This setting ensures a high transmission reserve and is therefore recommended for modulation measurements.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]LEVel:ATTenuation  NORMal | LNOIse | LDIStortion`

AF Generator

The *AF Generator* softkey configures the AF signal generated by the CMU.

Control

The *Control* hotkey switches the AF generator on or off.

The hotkey is operative in the *Modulation* application only; the other two applications require the AF generator to be switched on permanently. See section *Measurement Menu Analyzer/Generator* on page 4.2 ff.

Remote control

```
INITiate:AFGenerator; ABORt:AFGenerator
FETCh:AFGenerator:STATus?
```

Level

The *Level* hotkey defines the effective voltage of the AF signal.

See section *Measurement Menu Analyzer/Generator* on page 4.2 ff.

Remote control `SOURce:AFGenerator:LEVel <LEVel>`

Frequency

The *Frequency* hotkey defines the AF signal frequency in Hz.

See section *Measurement Menu Analyzer/Generator* on page 4.2 ff.

Remote control `SOURce:AFGenerator:FREQuency <FREQuency>`

Start Level

The *Start Level* hotkey defines the start value for the *AF Level Search* iteration.

This hotkey is available in the *AF Level Search* application only.

Remote control `[SENSe:]RFANalyzer:CHANnel <Number>`

Target Deviation The *Target Deviation* hotkey defines the deviation searched by variation of the AF level. This hotkey is available in the *AF Level Search* application only. See section *Measurement Control (TX Tests Configuration – Control)* on page 4.10.

Remote control `CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation <TargetDev>`

Target Error Range The *Target Error Range* hotkey defines the width of a deviation range centered around the *target deviation* which provides the stop criterion for the *AF Level Search* iteration. This hotkey is available in the *AF Level Search* application only. See section *Measurement Control (TX Tests Configuration – Control)* on page 4.10.

Remote control `CONFigure:TXTests:AFLSearch:CONTrol:TDERange <Range>`

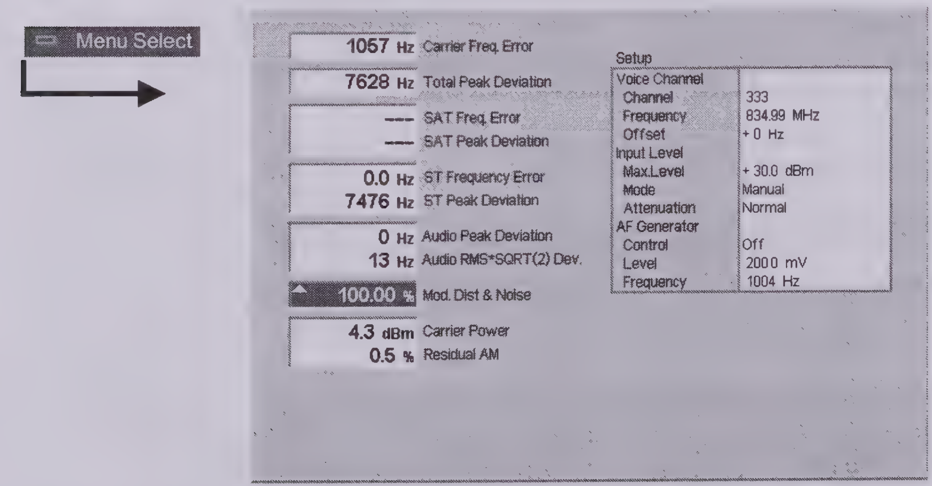
Menus The *Menus* softkey displays the hotkey bar for changing to the other measurement menus.

Measurement Results

The measurement menu *TX Tests* is divided into two sections:

- The output fields in the left half of the menu show the results of the *TX Tests*
- The table in the right half of the menu shows the current configuration settings

The results of the three alternative measurements (applications) in the *TX Tests* measurement group are displayed in three separate but similar measurement menus. The description below contains all possible results and settings of the measurement group but also indicates which of the values are application-specific (e.g. the *AF Search Level* which occurs in the *AF Level Search* application only).



1057 Hz Carrier Freq. Error
7628 Hz Total Peak Deviation
--- SAT Freq. Error
--- SAT Peak Deviation
0.0 Hz ST Frequency Error
7476 Hz ST Peak Deviation
0 Hz Audio Peak Deviation
13 Hz Audio RMS*SQRT(2) Dev.
100.00 % Mod. Dist & Noise
4.3 dBm Carrier Power
0.5 % Residual AM

Setup

Voice Channel	
Channel	333
Frequency	834.99 MHz
Offset	+ 0 Hz
Input Level	
Max.Level	+ 30.0 dBm
Mode	Manual
Attenuation	Normal
AF Generator	
Control	Off
Level	200.0 mV
Frequency	1004 Hz

Fig. 4-4 Display of measurement results (TX Tests – Modulation application)

Measurement results The measurement results are indicated in the output fields in the left half of the *TX Tests* menu. From top to bottom, they read:

Carrier Frequency Error	Deviation of the unmodulated transmitted carrier frequency from the assigned channel frequency (see Table 4-1 on page 4.40).
Total Peak Deviation	Maximum frequency deviation of the transmitted carrier due to the sum of the AF signal + SAT + ST. This result is measured in the unfiltered path; see Fig. 4-7 on page 4.13. It is available in the *Modulation* application only.
SAT Frequency Error	Deviation of the measured Supervisory Audio Tone (SAT) frequency from the nominal SAT frequency set in the *Connection Control* menu (see p. 4.38 ff.). This result is not available in the *AF Level Search* application. If the *SAT Peak Deviation* (see below) is not present, the result is invalid and the output field indicates "---".
SAT Peak Deviation	Maximum frequency deviation of the transmitted carrier due to the SAT. This result is not available in the *AF Level Search* application. If the *SAT Peak Deviation* is not present, the result is invalid and the output field indicates "---".
ST Frequency Error	Deviation of the measured Signalling Tone (ST) frequency from the nominal ST frequency of 10 kHz. This result is available in the *Modulation* application only. If the *ST Peak Deviation* (see below) is not present, the result is invalid and the output field indicates "---".
ST Peak Deviation	Maximum frequency deviation of the transmitted carrier due to the ST. This result is available in the *Modulation* application only. If the *ST Peak Deviation* is not present, the result is invalid and the output field indicates "---".
Audio Peak Deviation	Maximum frequency deviation of the transmitted carrier in the audio path (see Fig. 4-7). This result is not available in the *Hum & Noise* application.
*RMS*SQRT(2) Dev.*	RMS-averaged frequency deviation of the carrier in the audio path multiplied by the square root of 2.
Mod. Dist. & Noise	Level of the demodulated RMS noise and distortion in the audio path (produced by the audio distortion in the transmitter) relative to the level of the complete demodulated audio signal (including noise and distortion) in percent. This result is available in the *Modulation* application only.
Hum & Noise	Level change of the audio signal demodulated by the CMU which is caused by the signal modulating the MS transmitter, i.e. the audio output level with modulated RF transmitter relative to the audio output level with unmodulated RF transmitter. The Hum & Noise is expressed in dB; it is available in the *Hum & Noise* application only.
Carrier Power	Absolute power of the voice channel carrier in dBm.
Residual AM	Residual amplitude modulation, i.e. the ratio of the peak AC voltage to the DC voltage detected from the transmitter carrier which is modulated with the audio signal. The residual AM is indicated in percent; it is available in the *Modulation* application only.
AF Search Level	AF level corresponding to the *Target Audio Peak Deviation* set in the *Connection Control* menu; see p. 4.12 ff. This result is available in the *AF Level Search* application only.

Limit Check	A red output field and an arrow pointing upwards or downwards indicates that the measurement result exceeds the upper or lower limit set in the *Limits* tab of the *TX Tests* configuration menu, see p. 4.12.

Remote control	`READ[:SCALar]:TXTests:<Applic>[:RESult]?`
	`FETCh[:SCALar]:TXTests:<Applic>[:RESult]?`
	`SAMPle[:SCALar]:TXTests:<Applic>[:RESult]?`
	`CALCulate[:SCALar]:TXTests:<Applic>[:RESult]:MATChing:LIMit?`
	where `<Applic> = MODulation | HNOise | AFLSearch`

Configurations The current configuration settings are indicated in the table in the right half of the *TX Tests* menu. From top to bottom, they form the following groups:

Voice Channel	Voice channel frequency as defined in the *Analyzer/Generator* (see p. 4.2) or in the *Connection Control* menu (see p. 4.38 ff.).
Input Level	Maximum expected RF input level as defined in the *Group Configuration* menu (see p. 4.48 ff.).
AF Generator	Control and configuration of the AF Generator corresponding to the *AF Generator* softkey (see p. 4.7).

Remote control `SOURce:RFGenerator:FREQuency <Frequency>` etc.
`[SENSe:]LEVel:MAXimum <Level>` etc.
`INITiate:AFGenerator; ABORt:AFGenerator` etc.

Measurement Configurations (TX Tests Configuration)

The popup menu *TX Tests Configuration* contains three tabs which determine the parameters of the TX tests including the error tolerances.

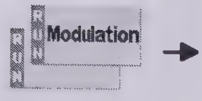
The popup menu *TX Tests Configuration* is activated by pressing the main softkey (labeled *Modulation, Hum & Noise*, or *AF Level Search*, according to the application selected) in the measurement menu *TX Tests* twice. It is possible to change between the tabs by pressing the associated hotkeys.

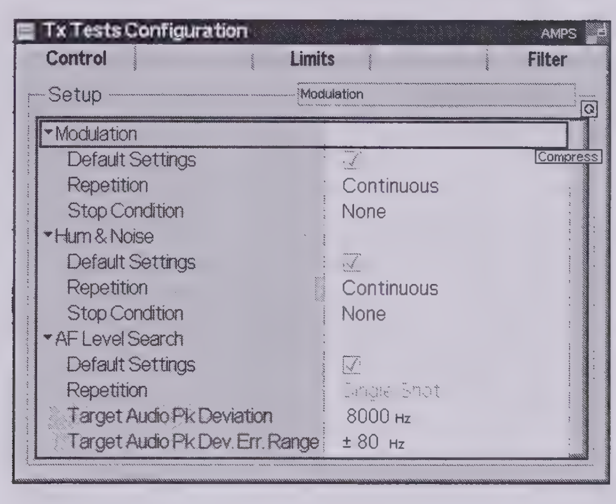
Measurement Control (TX Tests Configuration – Control)

The *Control* tab controls the *TX Tests* by determining

- The *Repetition* mode,
- The *Stop Condition* for the measurement.

All settings can be defined separately for the three applications *Modulation, Hum & Noise,* and *AF Level Search*.





Setup: Modulation

▾Modulation	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
▾Hum & Noise	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
▾AF Level Search	
Default Settings	☑
Repetition	Single Shot
Target Audio Pk Deviation	8000 Hz
Target Audio Pk Dev. Err. Range	± 80 Hz

Fig. 4-5 Power Configuration – Control

Default Settings The *Default* switch assigns default values to all settings in the *Control* tab (the default values are quoted in the command description in chapter 6 of this manual).

Remote Control `CONFigure:TXTests:<Applic>:CONTrol:DEFault ON | OFF`
where `<Applic> = MODulation | HNOise | AFLSearch`

Repetition The *Repetition* table row determines the repetition mode:

Single Shot	Single-shot measurement: the measurement is stopped after the system has settled and a valid result is available. It is stopped even before if the stop condition *On Limit failure* is set and if and if any of the tolerances are exceeded during the measurement. A stopped measurement is indicated by the status display *HLT* in the main softkey *Modulation/Hum & Noise/AF Level Search*.
Continuous	Continuous measurement: The CMU continues the measurement until it is terminated explicitly, or until the stop condition (see below) is met. The output is updated after each measurement cycle, i.e. after each single shot measurement. An ongoing measurement is indicated by the status display *RUN* in the softkey *Power*.

Single shot should be selected to obtain a measurement result under fixed conditions. The continuous mode is suitable for monitoring the evolution of a measured quantity in time, for example for adjustments.

Note: *In remote mode, the counting measurement (counting mode) is available as a further measurement mode with a defined number of measurement cycles to be performed, see chapter 6 of this manual.*

Remote control

```
CONFigure:TXTests:<Applic>:CONTrol:REPetition
      CONTinuous | SINGleshot | 1 ... 10000,<StopCondition>,
                                              <Stepmode>
```

where `<Applic> = MODulation | HNOise | AFLSearch`

Stop Condition The *Stop Condition* table row defines a stop condition for the measurement:

None	Continue measurement even if tolerance is exceeded
On Limit Failure	Stop measurement if tolerance is exceeded

Remote control

```
CONFigure:TXTests:<Applic>:CONTrol:REPetition
        <REPetition>,SONerror | NONE,<Stepmode>
```

where `<Applic> = MODulation | HNOise | AFLSearch`

AF Level Search The table section *AF Level Search* configures the iteration which is to determine the AF level causing a particular peak frequency deviation of the voice signal.

Target Audio Peak Deviation	Target value for the iteration in Hz
Target Audio Pk. Dev. Err. Range	Width of a frequency interval centered around the *Target Audio Peak Deviation* [target –range, target + range]

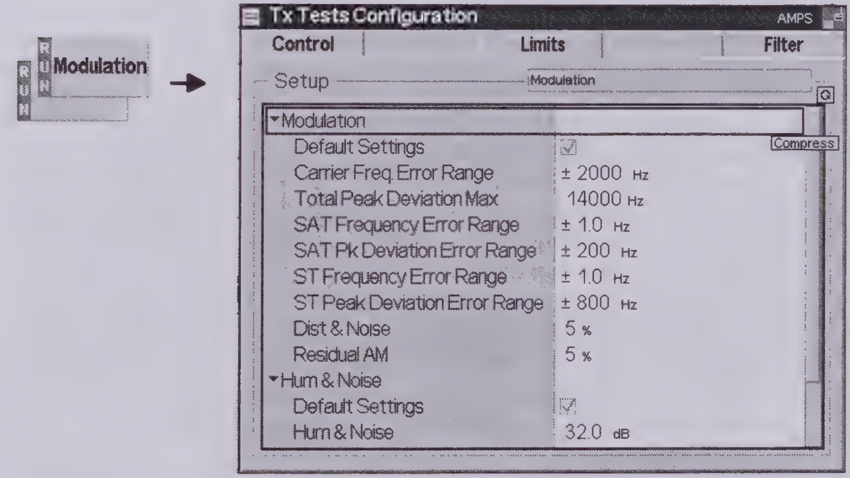
The *AF Level Search* consists of an iteration starting at the AF level set via the *Start Level* hotkey (see p. 4.7). The iteration is successfully stopped as soon as the audio peak deviation measured is within the *Target Audio Pk. Dev. Err. Range*. The search fails if no AF level corresponding to a deviation within the error range is found after a fixed maximum number of iteration steps.

Remote control

```
CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation <TargetDev>
CONFigure:TXTests:AFLSearch:CONTrol:TDERange <ErrRange>
```

Limits (TX Tests Configuration – Limits)

The *Limits* tab defines upper limits for the measured quantities in all three applications *(Modulation, Hum & Noise,* and *AF Level Search)* of the *TX Tests* measurement group.



▾Modulation	
Default Settings	☑
Carrier Freq. Error Range	± 2000 Hz
Total Peak Deviation Max	14000 Hz
SAT Frequency Error Range	± 1.0 Hz
SAT Pk Deviation Error Range	± 200 Hz
ST Frequency Error Range	± 1.0 Hz
ST Peak Deviation Error Range	± 800 Hz
Dist & Noise	5 %
Residual AM	5 %
▾Hum & Noise	
Default Settings	☑
Hum & Noise	32.0 dB

Fig. 4-6 TX Tests Configuration – Limit Lines

Default All Settings The *Default All Settings* switch assigns default values to all fields in the *Limits* tab (see chapter 6 of this manual). In addition, a default switch is provided for each of the three applications.

Remote control `CONFigure:TXTests:<Applic>:LIMit:DEFault ON | OFF`
where `<Applic> = MODulation | HNOise | AFLSearch`

Limits

The table sections *Modulation, Hum & Noise,* and *AF Level Search* define limits for all measured quantities of corresponding applications. For an explanation of these quantities refer to the introduction at the beginning of section *TX Tests* on page 4.4 and to section *Measurement Results* on page 4.8. The limits are to be interpreted as follows:

Frequency Errors	Upper limit for the absolute value of the frequency error in Hz.
Peak Deviations	Upper limit for the frequency deviation in Hz.
Residual AM	Upper limit of the residual amplitude modulation, expressed in percent.
Hum & Noise	Lower limit of the FM Hum & Noise, expressed in dB.

If the limit check fails for one of the measured quantities the corresponding output field in the *TX Tests* menu is red and an arrow pointing upwards or downwards indicates that the limit is exceeded.

Remote control

`CONFigure:TXTests:<Applic>:LIMit <CarrFreqErrRange>,...`
where `<Applic> = MODulation | HNOise | AFLSearch`
(note the different parameter lists in the three applications)

Path Configuration (TX Tests Configuration – Filter)

The *Filter* tab configures the voice-processing equipment of the CMU and thus specifies the audio receive path of the CMU for each of the three applications *Modulation, Hum & Noise,* and *AF Level Search* (see Fig. 4-7).

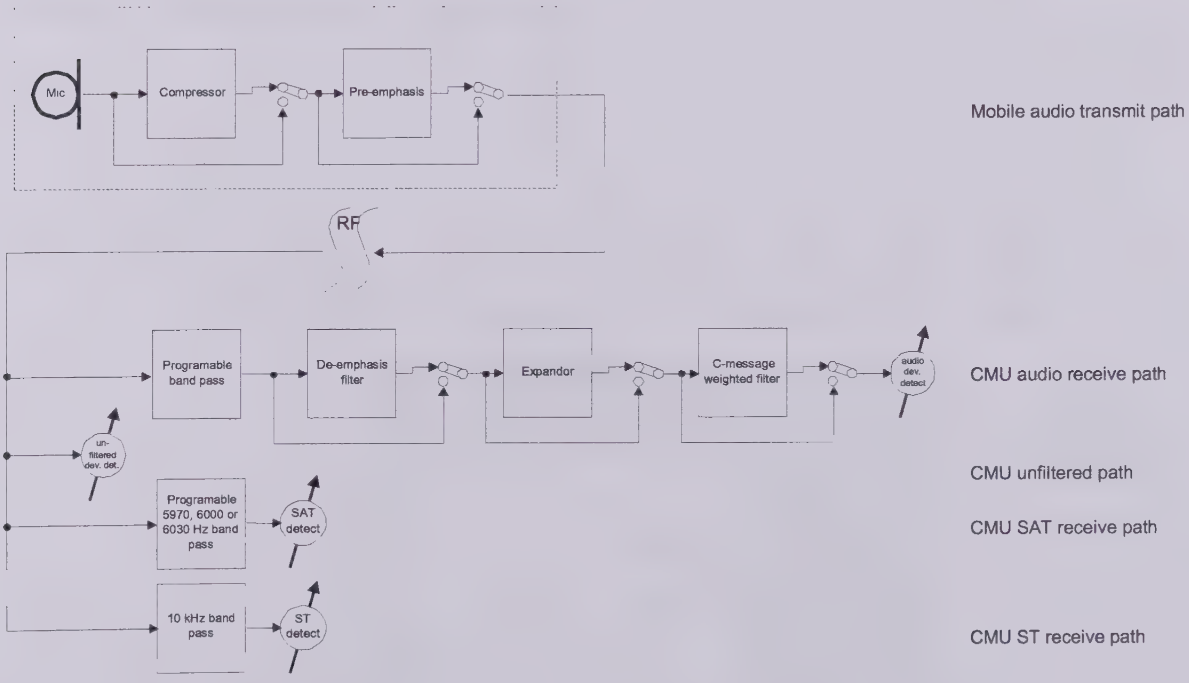


Fig. 4-7 Signal path for TX tests

The audio receive path of the CMU contains the following voice-processing stages:

Band Pass	Audio band pass filter with variable bandwidth to limit the input frequencies to a definite audio band and thus eliminate unwanted signal components that might affect the operation of the expandor. E.g. selection of the band between 50 Hz and 4000 Hz is recommended to eliminate the SAT from the audio path.
De-emphasis	Filter varying the gain of the input amplifier as a function of frequency. Together with the pre-emphasis of the mobile phone, this filter is to improve transmission of the high-frequency portions of the audio signal.
Expandor	Stage varying the gain of the output audio amplifier when an audio signal is received. According to the specifications of the standard, the expandor attenuates signals below a reference frequency deviation of 2.9 kHz; it amplifies signals that are above this reference deviation.
Weighting	Weighting filter according to CCITT or C-message weighted filter.

The audio results calculated by the tester (such as the *Audio Peak Deviation* etc.) are generated at the end of the audio receive path, after the audio signal has passed all filter stages. In addition, the 'on air' deviation is measured by the broad-band deviation meter and indicated as the *Total Peak Deviation*. This result corresponds to the *Audio Peak Deviation* with a bandpass filter of unlimited bandwidth and with all level-modifying components switched off.

As shown in Fig. 4-8, the de-emphasis of the tester decreases the frequency deviation of a 1000 Hz tone by approx. 13.6 dB, which amounts to a factor of 4.8. This means that, for an 'on air' deviation of 8000 MHz required for most of the TX tests, the de-emphasis decreases the measured *Audio Peak Deviation* of a 1000 Hz tone to about 1666 Hz. With the 2.9 kHz expandor switched into the signal path, this result is further decreased (as 1666 Hz < 2900 Hz); the displayed *Audio Peak Deviation* is approx. 957 Hz.

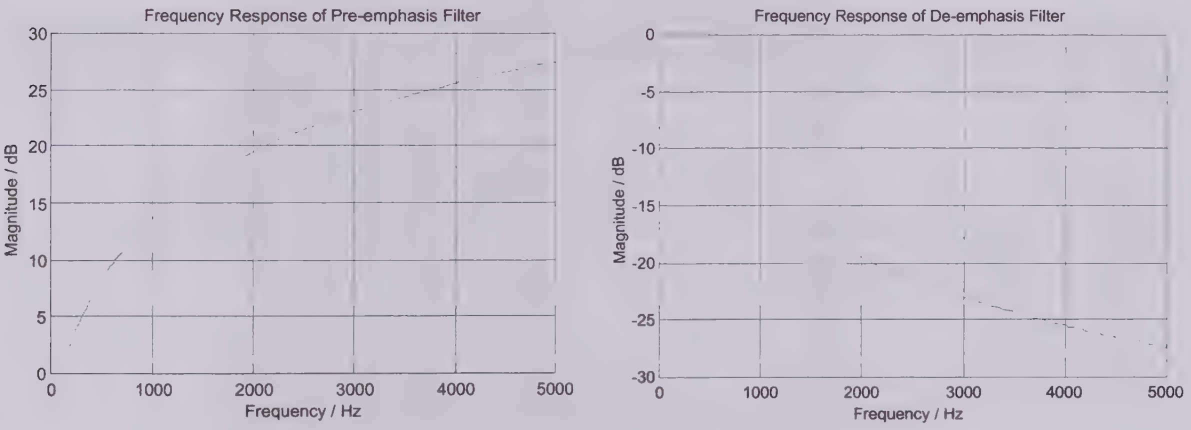
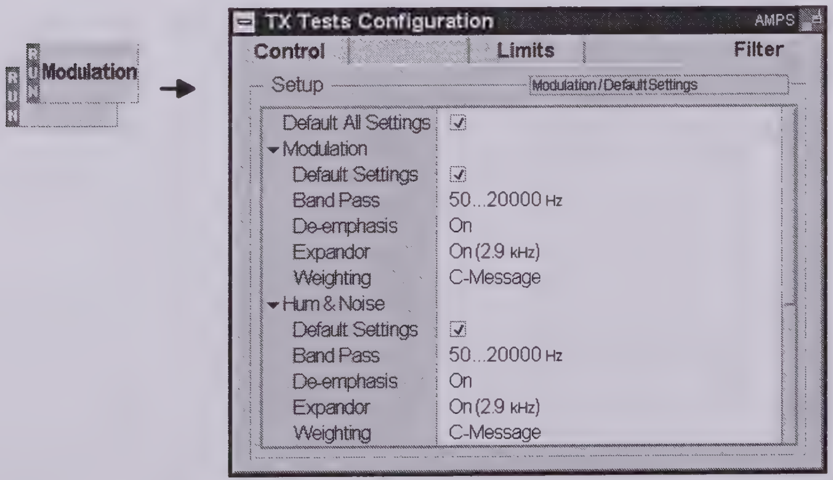


Fig. 4-8 Electrical frequency response of the pre-emphasis and a de-emphasis filter



Setup: Modulation / Default Settings

Default All Settings	☑
▾ Modulation	
Default Settings	☑
Band Pass	50...20000 Hz
De-emphasis	On
Expandor	On (2.9 kHz)
Weighting	C-Message
▾ Hum & Noise	
Default Settings	☑
Band Pass	50...20000 Hz
De-emphasis	On
Expandor	On (2.9 kHz)
Weighting	C-Message

Fig. 4-9 TX Tests Configuration – Filter

Default All Settings

The *Default All Settings* switch assigns default values to all fields in the *Limits* tab (see chapter 6 of this manual). In addition, a default switch is provided for each of the three applications.

Remote control

```
CONFigure:TXTests:<Applic>:FILTer:DEFault  ON | OFF
where <Applic> = MODulation | HNOise | AFLSearch
```

Modulation / Hum & Noise / AF Level Search

The table sections *Modulation, Hum & Noise,* and *AF Level Search* define the method of measurement for all quantities shown in the *TX Tests* menu in the corresponding application. For all three applications, the following settings are provided:

Band pass	Selection of the bandwidth of the CMU's audio band pass.
De-emphasis	Switching the 750 µs de-emphasis *On* or *Off*.
Expandor	Switching the 2.9 kHz Expandor *On* or *Off*.
Weighting	Use of a C-message weighted filter *(C-Message)*, a *CCITT* weighting filter or none of these filters *(OFF)*.

The rated specifications of the CMU's voice processing equipment are listed in the data sheet. For a list of band pass frequency ranges provided refer to the remote control command description in chapter 6 of this manual.

Remote control

```
CONFigure:TXTests:<Applic>:FILTer
              <BPass>,<Deemphasis>,<Expandor>,<Weighting>
where <Applic> = MODulation | HNOise | AFLSearch
```

TX Audio Freq. Response

The menu group *TX Audio Freq. Response* provides the measurement of the electrical audio response of the mobile phone transmitter. The measurement results are displayed in the graphical measurement menu *TX Audio Freq. Response,* the popup menu *TX Audio Freq. Response Configuration* is used for configuration of the measurements.

The electrical audio frequency response is the ratio of the frequency deviation of the analog MS voice transmitter Δf to the frequency deviation of a reference pre-emphasis Δf_{ref}. This quantity is measured as a function of the audio input frequency and expressed in dB[1]. The test is to ensure that the frequency deviation is sufficiently close to the prescribed pre-emphasis characteristic when the input frequency varies over the relevant range.

To speed up the measurement, the CMU generates a composite audio signal which represents the superposition of up to 20 individual fixed-frequency tones with configurable frequency and level. By demodulating the MS transmitter output, the electrical audio frequency response for all these tones can be determined simultaneously. With an appropriate configuration of the test tones, it is possible to evaluate the electrical frequency response in a single measurement over the whole specified range of audio frequencies. The test setup is as shown in Fig. 4-2 on page 4.4.

Note: *It is advisable to switch off the mobile compressor as it might impair the* TX Audio Freq. Response *measurement.*

Measurement Menu (TX Audio Freq. Response)

The graphical measurement menu *TX Audio Freq. Response* shows the results of the transmitter frequency response test.

- The main softkey *TX Audio Freq. Response* indicates the status of the *TX Audio Freq. Response (RUN | HLT | OFF)* and opens the configuration menu *TX Audio Freq. Response Config* (press twice).
- The other softkeys to the right of the test diagram are combined with various hotkeys (e.g. the hotkeys *Voice Channel, Frequency,* and *Offset* belong to the softkey *Voice Channel).* If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates the current setting and enables an entry (for an example, see section *Measurement Menu (TX Tests)* on page 4.5 ff.).

The measurement menu *TX Audio Freq. Response* is opened via the main menu *Menu Select* (with the associated key at the front of the instrument) or using the *TX Audio Freq. Response* hotkey.

---

[1] The frequency deviation is treated as voltage to calculate the dB-ratio, i.e. the frequency response is $20\log_{10}\frac{\Delta f}{\Delta f_{ref}}\mathrm{dB}$.

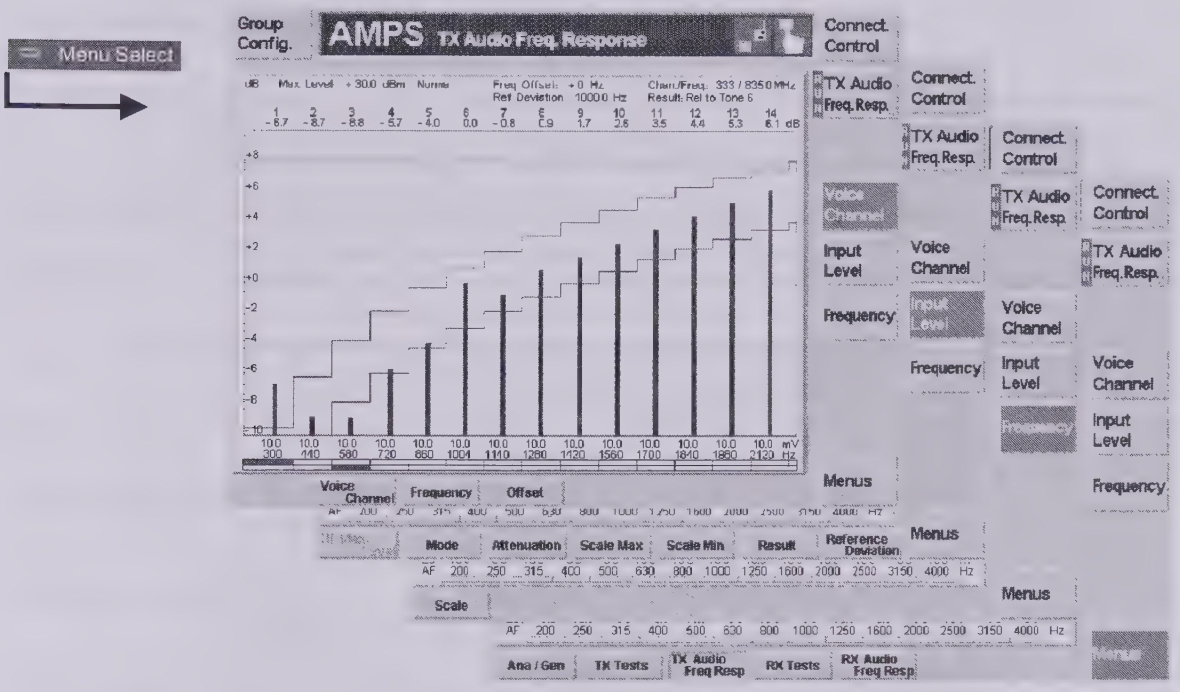


Fig. 4-10 Measurement menu TX Audio Freq. Response

Test Settings

The test settings for the voice channel frequency (softkey *Voice Channel)* are identical with those in the TX Tests menu; see section *Test Settings* on page 4.6.

Input Level

The *Input Level* softkey configures the RF input level and sets the y-axis scale of the test diagram.

RF Max. Level

The *RF Max. Level* hotkey determines the maximum expected RF input level.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]LEVel:MAXimum  <Level>`

Attenuation

The *Attenuation* hotkey selects a strategy for tuning the RF analyzer.

Normal	Input signal is kept unchanged
Low Noise	Enhanced mixer level. This setting ensures the full dynamic range of the CMU and is therefore recommended for power measurements.
Low Distortion	Decreased mixer level. This setting ensures a high transmission reserve and is therefore recommended for modulation measurements.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]LEVel:ATTenuation  NORMal | LNOIse | LDIStortion`

Scale Max.

The *Scale Max.* hotkey defines the upper edge of the test diagram.

This value corresponds to the maximum measurement value (in dB) which can be viewed.

Remote control `DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe <ScaleMin, <ScaleMax>`

Scale Min.

The *Scale Min.* hotkey defines the lower edge of the test diagram.

This value corresponds to the minimum measurement value (in dB) which can be viewed.

Remote control `DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe <ScaleMin, <ScaleMax>`

Result

The *Result* hotkey defines the reference value for all measurement results.

This corresponds to the 0 dB reference line in the diagram.

Relative to Ref. Deviation [dB]	All results are referenced to a particular reference deviation
Relative to Tone 1 [dB]	All results are referenced to the measurement result at tone 1 (if available)
...	
Relative to Tone 20 [dB]	All results are referenced to the measurement result at tone 20 (if available)

The reference deviation is defined via the *Reference Deviation* hotkey described below. The measurement is taken at up to 20 audio frequencies (tone 1 to 20) which can be defined and switched on or off in the *Freq./Level* tab of the configuration menu (see page 4.21 ff.). For a description of the test diagram refer to section *Measurement Results* on page 4.19.

Remote control `CONFigure:TXAFresp:CONTrol:RREQuest  RDEV | TON<nr>`

Reference Deviation

The *Reference Deviation* hotkey defines a reference frequency deviation.

This value is taken as reference deviation, i.e. it defines the 0 dB line of the test diagram provided that this is selected as an option via the *Result* hotkey (see above).

Remote control `CONFigure:TXAFresp:CONTrol:RDEViation <Deviation>`

Frequency

The *Frequency* softkey sets the x-axis scale of the test diagram.

Scale

The *Scale* hotkey selects the display range of the test diagram.

The display range comprises 14 different tones which must be in consecutive order. This condition leaves the following selections:

Tone 1 to 14	Display all results between tone 1 and tone 14
...	
Tone 7 to 20	Display all results between tone 7 and tone 20

If a tone is within the selected range but disabled in the Freq./Level tab of the configuration menu (see p. 4.22 ff.), the corresponding result is not indicated, i.e. the bar is omitted and a gap occurs in the test diagram.

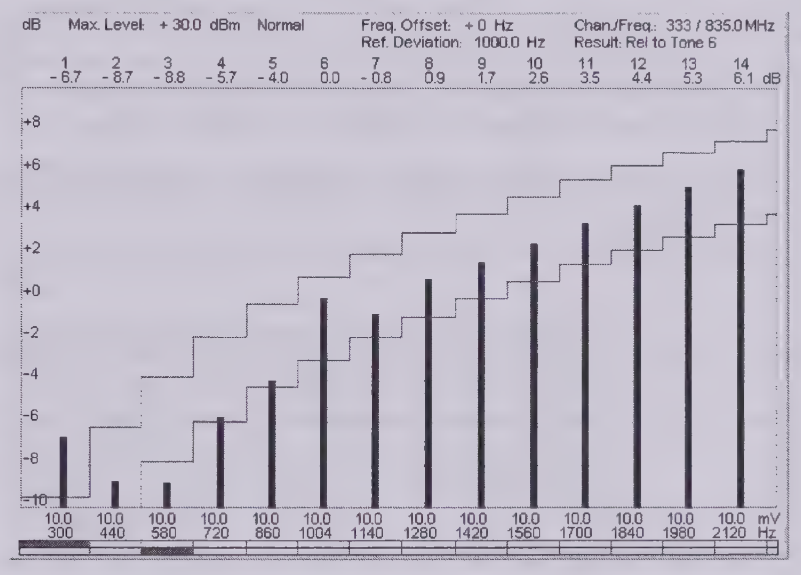
Remote control –

Menus

The *Menus* softkey displays the hotkey bar for changing to the other measurement menus.

Measurement Results

In the *TX Audio Freq. Response* measurement, the frequency response of the MS transmitter at up to 14 out of 20 different audio input frequencies is displayed. These results and the test settings are indicated in two parameter lines and the actual test diagram (bar graph):


dB Max. Level: + 30.0 dBm Normal
Freq. Offset: + 0 Hz
Ref. Deviation: 1000.0 Hz
Chan./Freq.: 333 / 835.0 MHz
Result: Rel to Tone 6
1 2 3 4 5 6 7 8 9 10 11 12 13 14
- 6.7 - 8.7 - 8.8 - 5.7 - 4.0 0.0 - 0.8 0.9 1.7 2.6 3.5 4.4 5.3 6.1 dB
+8 +6 +4 +2 +0 -2 -4 -6 -8 -10
10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 mV
300 440 580 720 860 1004 1140 1280 1420 1560 1700 1840 1980 2120 Hz

Parameter lines

Test tone no. and frequency response

Bar graph with upper and lower limit lines

Test tone voltage and frequency

Fig. 4-11 Display of measurement results (TX Audio Freq. Response)

Parameter lines The first parameter line contains the following settings:

RF Max. Level	Maximum RF input level set as in *Input Level - Mode* (see section *Input Level (Group Configuration – Input Level)* on page 4.48)
Attenuation	Setting for the external attenuation of the input level *(Normal, Low Noise, Low Distortion)*
Result	Reference value for all deviations as set via the *Result* softkey (see p. 4.18)
Chan./Freq.	RF channel and associated frequency

The second parameter line contains the following settings:

Ref. Deviation	Reference deviation as set via the *Reference Deviation* softkey (see p. 4.18)
Freq. Offset	Frequency offset relative to the nominal channel frequency

Remote control The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Bar graph The bar graph shows the transmitter audio frequency response in dB at a maximum of 14 different audio frequencies corresponding to a continuous range of test tones configured in the *Freq./Level* tab of the configuration menu (see p. 4.22 ff.). If a test tone is disabled in the configuration menu, the corresponding bar is omitted.

Frequency axis (abscissa) The range of test tones (no. 1 to 14, 2 to 15 etc.) to be viewed can be selected via the *Frequency* softkey. The bars representing the frequency response at the different tones are equidistantly distributed over the whole diagram width. This optimizes the readability of the diagram but implies that the abscissa scale is not necessarily linear. Therefore, the frequency and voltage of every single test tone is displayed below the frequency axis.

Frequency response axis (ordinate)	The ordinate can be arbitrarily scaled by setting a maximum and minimum value (both in dB). With a fixed ordinate, the adjustable 0 dB reference line (see *Result* softkey on p. 4.18) allows to shift the whole diagram vertically.
Remote control	`READ:ARRay:TXAFresp[:RESult]?` etc. `READ[:SCALar]:TXAFresp[:RESult]:TONE<nr>?` etc.
Limit Check	The upper and lower limit lines for each test point defined in the *Limit Lines* tab of the configuration menu (see p. 4.21) yield the two red step functions in the diagram. If the limit check fails at a particular test point the corresponding section of the red bar across the bottom of the diagram is shifted upwards.

Remote control	`CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE]:TONE?`
	`CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE]`
	`:TONE<nr>?`

Measurement Configurations (TX Audio Freq. Response Configuration)

The popup menu *TX Audio Freq. Response Configuration* contains four tabs which determine the parameters of the *TX Audio Freq. Response* measurement including the error tolerances.

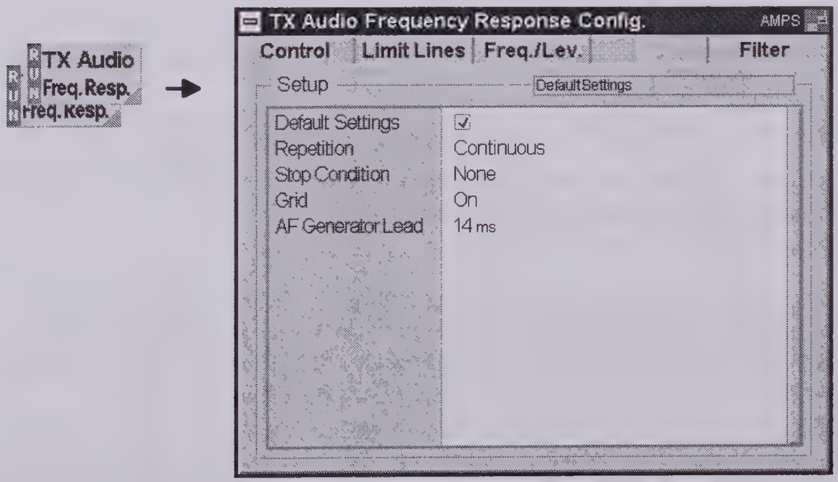
The popup menu *TX Audio Freq. Response Configuration* is activated by pressing the main softkey *TX Audio Freq. Resp.* in the measurement menu *TX Audio Freq. Response* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Measurement Control (TX Audio Freq. Response Configuration – Control)

The *Control* tab controls the *TX Audio Freq. Response* measurement by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- A settling time for the AF generator *(AF GeneratorLead).*

Besides, it configures the measurement diagram by adding or removing the *Grid.*



Default Settings ☑
Repetition Continuous
Stop Condition None
Grid On
AF Generator Lead 14 ms

Fig. 4-12 TX Audio Freq. Response Configuration – Control

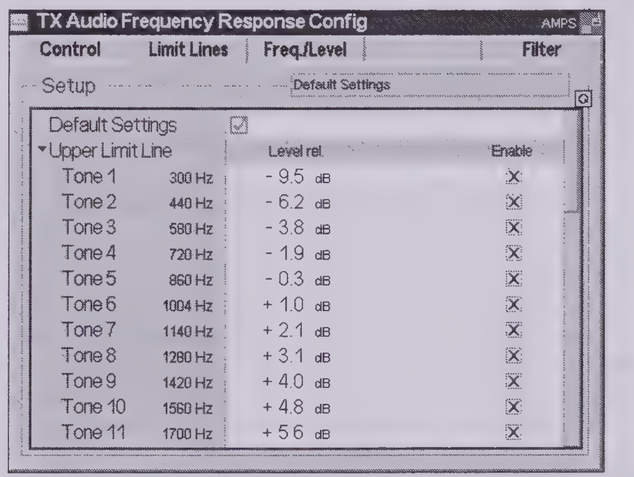
The settings for the *Repetition* mode, the Stop Condition, and the Grid comply with those of the menu *Control* in the menu group *TX Tests* (see page 4.10). In the remote-control commands, the keywords `TXTests:<Applic>` are to be replaced by `TXAFresp`.

AF Generator Lead The *AF Generator Lead* line defines a settling time for the measurement applied after a change of the generator settings. A small value accelerates the measurement but may impair its accuracy.

Remote control `CONFigure:TXAFresp:CONTrol:AFGLead <Time>`

Limit Lines (TX Audio Freq. Response Configuration – Limit Lines)

The *Limit Lines* tab defines upper and lower limits for the electrical audio frequency response at all test tones and enables or disables the limit check.



		Level rel.	Enable
Default Settings		☑	
Upper Limit Line			
Tone 1	300 Hz	- 9.5 dB	☒
Tone 2	440 Hz	- 6.2 dB	☒
Tone 3	580 Hz	- 3.8 dB	☒
Tone 4	720 Hz	- 1.9 dB	☒
Tone 5	860 Hz	- 0.3 dB	☒
Tone 6	1004 Hz	+ 1.0 dB	☒
Tone 7	1140 Hz	+ 2.1 dB	☒
Tone 8	1280 Hz	+ 3.1 dB	☒
Tone 9	1420 Hz	+ 4.0 dB	☒
Tone 10	1560 Hz	+ 4.8 dB	☒
Tone 11	1700 Hz	+ 5.6 dB	☒

Fig. 4-13 TX Audio Freq. Response Configuration Configuration – Limit Lines

Default Settings The *Default All Settings* switch assigns default values to all fields in the *Limit Lines* tab (see chapter 6 of this manual).

Remote control `CONFigure:TXAFresp:LIMit[:LINE]:DEFault  ON | OFF`

Upper Limit Line/ Lower Limit Line Upper and lower limit lines for all 20 test points can be defined separately in the two table sections *Upper Limit Line* and *Lower Limit Line.*

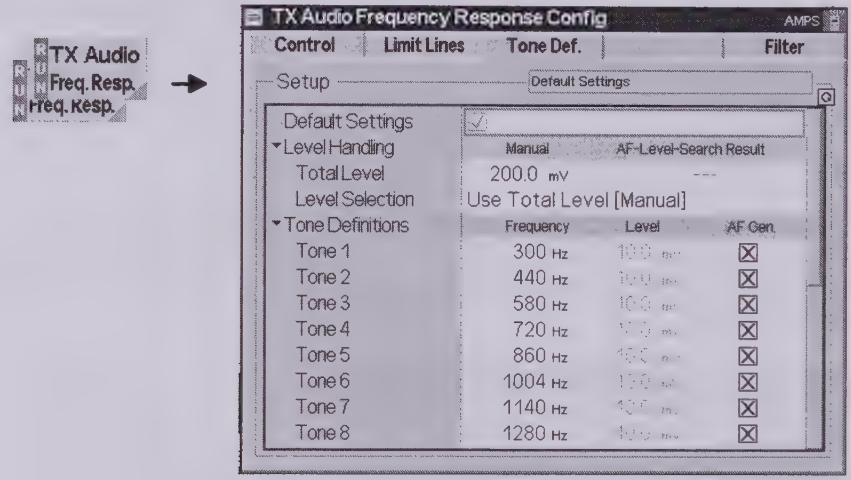
The tone nos. and the corresponding frequencies are indicated in the two left columns of the table as defined in the *Freq./Level* tab (see p. 4.22). For each tone, the upper and lower limit can be entered as a single value in dB. The corresponding *Enable* checkbox switches the limit line in the test diagram and the limit check on (if checked) or off.

Remote control

```
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer
          <Limit_1>, <Enable_1>...
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer:TONE<nr>
          <Limit>, <Enable>...
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer
          <Limit_1>, <Enable_1>...
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer:TONE<nr>
          <Limit>, <Enable>...
```

Test Tones (TX Audio Freq. Response Configuration – Tone Def.)

The *Tone Def.* tab configures the audio test signal to be applied to the input of the mobile station transmitter. This signal is composed of up to 20 test tones with different frequencies and levels.



Setup: Default Settings

Setup	Manual	AF-Level-Search Result
Default Settings	☑	
Level Handling	Manual	AF-Level-Search Result
Total Level	200.0 mV	---
Level Selection	Use Total Level [Manual]	

Tone Definitions	Frequency	Level	AF Gen.
Tone 1	300 Hz	10.0 mV	☒
Tone 2	440 Hz	10.0 mV	☒
Tone 3	580 Hz	10.0 mV	☒
Tone 4	720 Hz	10.0 mV	☒
Tone 5	860 Hz	10.0 mV	☒
Tone 6	1004 Hz	10.0 mV	☒
Tone 7	1140 Hz	10.0 mV	☒
Tone 8	1280 Hz	10.0 mV	☒

Fig. 4-14 TX Audio Freq. Response Configuration Configuration – Filter

Default Settings	The *Default All Settings* switch assigns default values to all fields in the *Freq./Level* tab (see chapter 6 of this manual).
Remote control	`CONFigure:TXAFresp:AFGenerator:DEFault ON | OFF`
Level Handling: Total Level[2]	The *Total Level* parameter defines the sum of the individual voltages of all enabled tones. The meaning of the total level depends on the *Level Selection* setting, see below. The *Total Level* entered in the *Manual* column must not exceed the maximum level of the AF generator quoted in the data sheet.
Remote control	`CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel <TotalLevel>`

Level Selection The *Level Selection* table section defines how the voltage of each of the test tones is determined:

Use separate levels for each tone
The *Total Level* is ignored. It can still be edited for future measurements where the *Level Selection* parameter is set to *Manual*.

Use Total Level (Manual)
The *Total Level* entered in the *Manual* column is evenly distributed among all test tones. This means that the level of each test tone enabled via the *AF Gen.* switch in the *Tone Definitions* table is set to *Total Level / n* where n is the number of test tones enabled (n = 1 to 20).

Use AF Level Search Result
The *Total Level* from the *AF Level Search Result* column is evenly distributed among all test tones. This option is available after an *AF Level Search* has been performed; see section *Measurement Menu (TX Tests)* on page 4.5 ff. Otherwise the *AF Level Search Result* column shows an invalid result.

---

[2] In firmware V2.50 (CDMA/AMPS), the *Level Handling* section is not available. The level must be set for each tone separately. This must be done by means of the `TXAFresp:TDEFinition...` commands; see Chapter 6 of this manual.

The *AF Level Search Result* is the total AF level corresponding to a definite audio peak deviation set in the TX Tests measurement. The combined *AF Level Search* and *TX Audio Frequency Response* measurement determines the electrical audio frequency response of the mobile phone transmitter at a definite audio peak deviation of the voice signal.

Remote control

```
CONFigure:TXAFresp:LEVel:LMODE TLEV | SLEV | SRES
```

Tone Definitions The *Tone Definitions* table assigns an audio frequency (in Hz) and RMS voltage (in mV) to each of the 20 test tones.

The frequencies must be multiples of 1 Hz. It is possible, however, to define several tones at the same frequency, or to number the tones in arbitrary order: The x-axis is scaled by the **number** of the test tones, not by their frequency. The RMS voltages *(levels)* of different tones may coincide and can vary within the range quoted in the remote control command description in chapter 6 of this manual. The sum of all test tones must not exceed the maximum level of the AF generator quoted in the data sheet.

Note: *The voltages of all test tones enabled can be set manually or automatically, depending on the setting of the* Level Selection *parameter described above.*

The *AF Gen.* checkbox switches the tone in the audio signal and the corresponding bar in the test diagram on (if checked) or off.

Remote control

```
CONFigure:TXAFresp:AFGenerator:ENABle ON | OFF, ON | OFF, ...
CONFigure:TXAFresp:AFGenerator:FREQuency <Freq1>, <Freq2>,...
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel
          <Lev1>, <Lev2>,...
CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel <TotalLevel>
```

Path Configuration (TX Audio Freq. Response Configuration – Filter)

The *Filter* tab configures the voice-processing equipment of the CMU and thus specifies the audio receive path of the CMU for the *TX Audio Freq. Response* tests.

All functions of this menu are described in section *Path Configuration (TX Tests Configuration – Filter)* on page 4.13. In the remote control commands, the keywords `TXTests:<Applic>` are to be replaced by `TXAFresp`.

RX Tests

The menu group *RX Tests* comprises the measurement of parameters characterizing the receiver quality of the mobile phone. The measurement results are displayed in the measurement menu *RX Tests,* the popup menu *RX Tests Configuration* is used for configuration of the measurements.

Quantities characterizing the mobile phone receiver quality are determined as follows:

The mobile is connected to the CMU via one of the bidirectional RF connectors and the AF inputs/outputs as shown in Fig. 4-15. With this test setup, the CMU transmits the RF voice carrier which can be modulated with an audio signal, the SAT and the ST, if so desired. The CMU measures the AF output signal of the mobile phone receiver (fed in via *AF IN*). The signals are configured in the *Analyzer/Generator* (see p. 4.2, note that the audio signal modulated onto the RF carrier is the one configured via the *Mod. Generator* softkey) and the *Connection Control* menu (see p. 4.38).

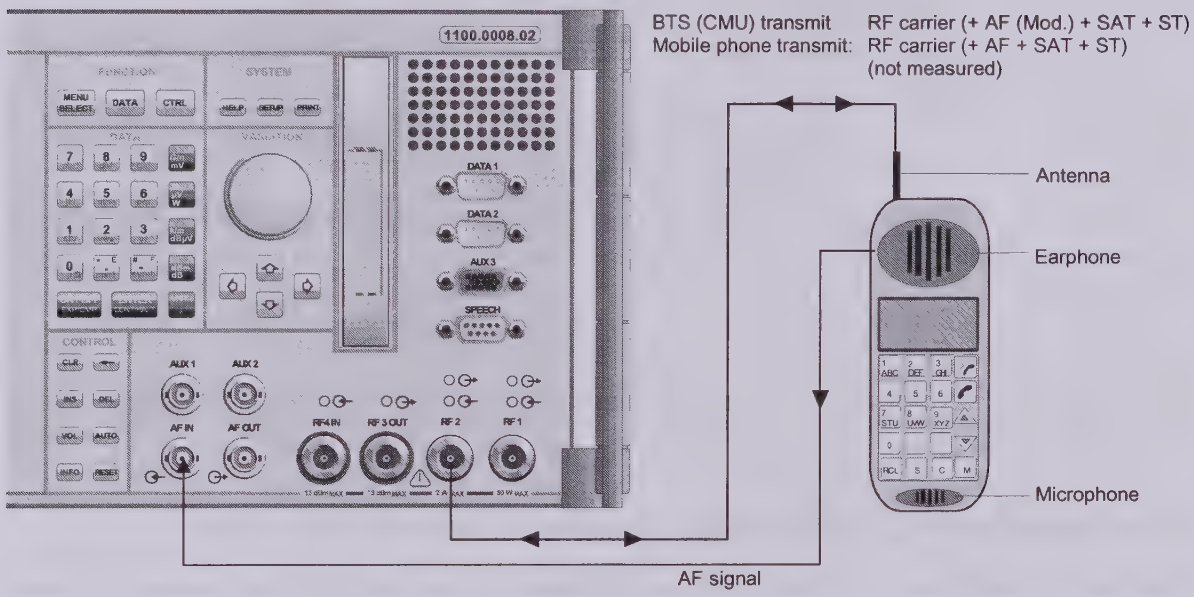


Fig. 4-15 Test setup for RX Tests

The standard describes the quantities to be measured and specifies the minimum requirements and the method of measurement for each quantity. The measurement group is divided into three independent menus corresponding to different configuration data sets and different results (applications *AF Analyzer, Hum & Noise, Sensitivity),* which are explained in more detail in section *Measurement Results* on page 4.28 ff.

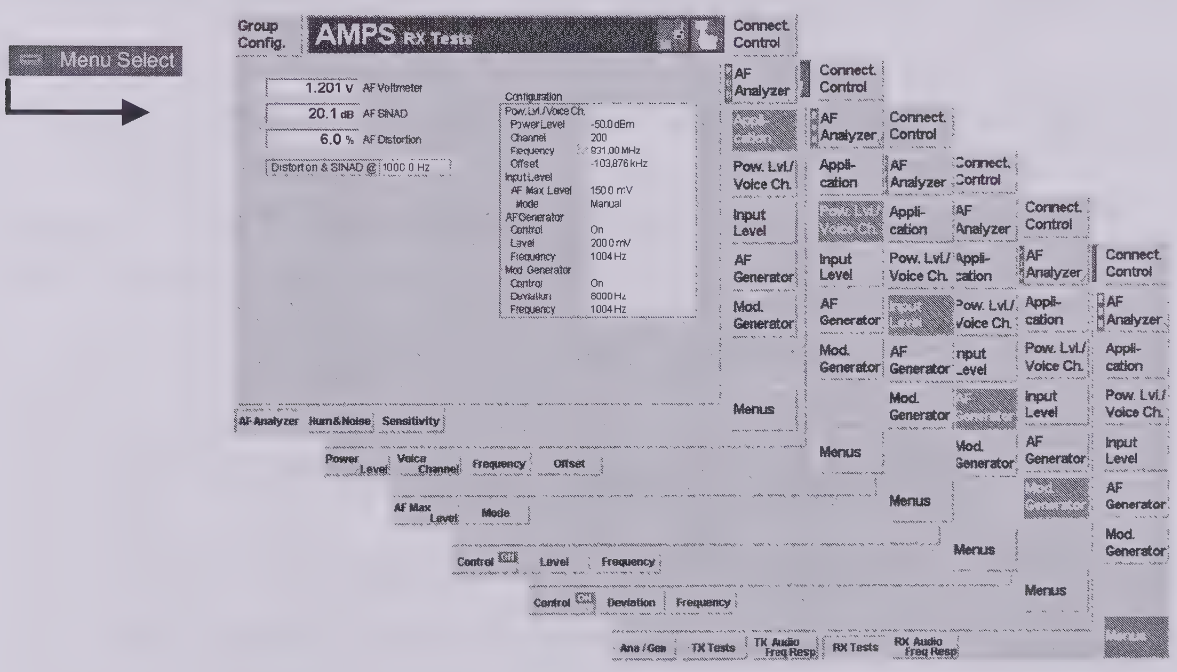
Note that the CMU analyzer functions as a standard test receiver with several switchable voice-processing stages. This equipment can be configured in the *Filter* tab of the *RX Tests Configuration* menu (see p. 4.32) to meet the requirements for the different methods of measurement described in the standard.

Measurement Menu (RX Tests)

The measurement menu *RX Tests* shows the results of the receiver tests.

- The main softkey *AF Analyzer* (which changes to *Hum & Noise* and *Sensitivity* if one of these applications is selected) indicates the status of the *RX Tests (RUN | HLT | OFF)* and opens the configuration menu *RX Tests Config* (press twice).
- The other softkeys to the right of the test diagram are combined with various hotkeys (e.g. the hotkeys *Control, Level,* and *Frequency* belong to the softkey *AF Generator).* If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates the current setting and enables an entry (for an example, see section *Measurement Menu (TX Tests)* on page 4.5 ff.).

The measurement menu *RX Tests* is opened via the main menu *Menu Select* (with the associated key at the front of the instrument) or using the *RX Tests* hotkey.



1.201 V AF Voltmeter
20.1 dB AF SINAD
6.0 % AF Distortion
Distortion & SINAD @ 1000.0 Hz

Configuration
Pow.Lvl./Voice Ch.
Power Level -50.0 dBm
Channel 200
Frequency 831.00 MHz
Offset -103.876 kHz
Input Level
AF Max Level 150.0 mV
Mode Manual
AF Generator
Control On
Level 200.0 mV
Frequency 1004 Hz
Mod. Generator
Control On
Deviation 8000 Hz
Frequency 1004 Hz

Fig. 4-16 Measurement menu TX Tests

Test Settings

Appli-cation

The *Application* softkey activates the selection of the type of measurement to be performed and the measured quantities.

The results of the three alternative measurements (applications) are displayed in separate measurement menus. When an application is selected, the corresponding measurement menu is called up and the labeling of the main softkey controlling the measurement is adapted. The configuration settings for all applications, however, are listed in a common popup-menu (see p. 4.29 ff.).

AF Analyzer

The *AF Analyzer* hotkey activates the measurement of received audio signal parameters, in particular the *AF SINAD* (see definition at the beginning of this section on page 4.16), and the AF distortion.

Remote control

No explicit switchover command. All *RX Tests – AF Analyzer* measurements are identified by the 2nd/3rd level keywords `...RXTests:AFANalyzer...`

Hum&Noise

The *Hum & Noise* hotkey activates the hum & noise measurement.

See explanation at the beginning of this section on page 4.16.

Remote control

No explicit switchover command. All *RX Tests – Hum & Noise* measurements are identified by the 2nd/3rd level keywords `...RXTests:HNOise...`

Sensitivity

The *Sensitivity* hotkey activates the measurement of the sensitivity level of the receiver, i.e. the RF signal strength in dBm corresponding to a definite *Target SINAD*. The CMU performs repeated single shot measurements at varying RF signal levels until the *Target SINAD* (defined in the *Control tab* of the *RX Tests Configuration* menu, see p. 4.31 ff.) is found or a stop condition met.

Remote control

No explicit switchover command. All *RX Tests – Sensitivity* measurements are identified by the 2nd/3rd level keywords `...RXTests:SENSitivity...`

Power Lvl./ Voice Ch.

The *Power Lvl./Voice Ch.* softkey activates the input of the RF voice signal frequency generated.

Power Level

The *Power Level* hotkey defines the power (in dBm) of the RF voice signal generated. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.38.

Remote control

```
SOURce:RFGenerator:LEVel <Level>
```

Voice Channel

The *Voice Channel* hotkey defines the channel number of the RF voice signal generated. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.38.

Remote control

```
SOURce:RFGenerator:FREQuency:UNIT CH
SOURce:RFGenerator:FREQuency <Channel>
```

Frequency

The *Frequency* hotkey defines the signal frequency in MHz of the RF voice signal generated. See section *Control of Input and Output Signals (Connection Control – Signal)*, Panel *Analyzer Settings* on page 4.38.

Remote control

```
SOURce:RFGenerator:FREQuency <Frequency>
```

Offset

The *Offset* hotkey defines the frequency offset of the RF voice signal analyzed.

See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.38.

Remote control

```
SOURce:RFGenerator:FREQuency:OFFSet <Offset>
```

Target SINAD

The *Target SINAD* hotkey defines the SINAD searched by variation of the RF level. This hotkey is available in the *Sensitivity* application only. See section *Measurement Control (RX Tests Configuration – Control)* on page 4.30 ff.

Remote control

```
CONFigure:RXTests:SENSitivity:CONTrol:TSINad <Target>
```

Tgt. SINAD Err. Range

The *Tgt. SINAD Err. Range* hotkey defines the width of a SINAD range centered around the target SINAD which provides the stop criterion for the *Sensitivity* search iteration. This hotkey is available in the *Sensitivity* application only. See section *Measurement Control (RX Tests Configuration – Control)* on page 4.30 ff.

Remote control `CONFigure:RXTests:SENSitivity:CONTrol:TSERange <Range>`

Input Level

The *Input Level* softkey configures the audio input level.

AF Max. Level

The *AF Max. Level* hotkey determines the maximum expected audio input level.

An entry can be made in manual mode only; see description of the next hotkey. See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]AFLEVel:MAXimum  <Level>`

Mode

The *Mode* hotkey determines how the maximum audio input level is defined.

Manual	Manual input of audio reference level
Auto	Automatic setting according to the level of the applied AF input signal. This is more convenient but may also be more time-consuming than the manual setting.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]AFLEVel:MODE  MANual | AUTOmatic`

AF Generator

The *AF Generator* softkey configures the audio signal generated by the CMU. See section *Measurement Menu Analyzer/Generator* on page 4.2 ff.

Control

The *Control* hotkey switches the AF generator on or off.

Remote control `INITiate:AFGenerator; ABORt:AFGenerator`

Level

The *Level* hotkey defines the effective voltage of the AF signal.

Remote control `SOURce:AFGenerator:LEVel <Level>`

Frequency

The *Frequency* hotkey defines the AF signal frequency in Hz.

Remote control `SOURce:AFGenerator:FREQuency <Frequency>`

Mod. Generator

The *Mod. Generator* softkey configures the modulation signal generated by the CMU. See section *Measurement Menu Analyzer/Generator* on page 4.2 ff.

Control

The *Control* hotkey switches the modulation generator on or off.

Remote control `INITiate:MODGenerator; ABORt:MODGenerator`

Deviation The *Deviation* hotkey defines the peak frequency deviation used to transmit the modulation signal over the RF carrier.

Remote control `SOURce:MODGenerator:DEViation <Deviation>`

Frequency The *Frequency* hotkey defines the modulation signal frequency in Hz.

Remote control `SOURce:MODGenerator:FREQuency <Frequency>`

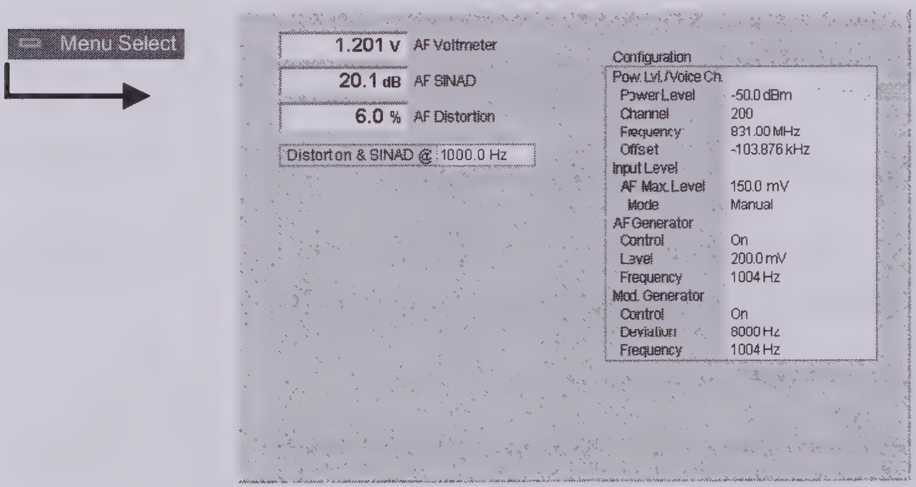
Menus The *Menus* softkey displays the hotkey bar for changing to the other measurement menus.

Measurement Results

The measurement menu *RX Tests* is divided into two sections:

- The output fields in the left half of the menu show the results of the *RX Tests.*
- The table in the right half of the menu shows the current configuration settings.

The results of the three alternative measurements (applications) in the *RX Tests* measurement group are displayed in three separate but similar measurement menus. The description below contains all possible results and settings of the measurement group but also indicates which of the values are application-specific (e.g. the *AF Search Level* which occurs in the *Sensitivity* application only).



1.201 V AF Voltmeter
20.1 dB AF SINAD
6.0 % AF Distortion
Distortion & SINAD @ 1000.0 Hz

Configuration

Pow. Lvl./Voice Ch.	
Power Level	-50.0 dBm
Channel	200
Frequency	831.00 MHz
Offset	-103.876 kHz
Input Level	
AF Max. Level	150.0 mV
Mode	Manual
AF Generator	
Control	On
Level	200.0 mV
Frequency	1004 Hz
Mod. Generator	
Control	On
Deviation	8000 Hz
Frequency	1004 Hz

Fig. 4-17 Display of measurement results (RX Tests – AF Analyzer application)

Measurement results The measurement results are indicated in the output fields in the left half of the *RX Tests* menu. From top to bottom, they read:

AF Voltmeter	RMS voltage of the audio signal fed in via *AF IN*.
AF Distortion	RMS voltage of the sum of the second and higher harmonic components in the audio output of the receiver relative to the RMS voltage of the complete audio output signal for a specified input signal at the receiver. This result expressed in percent and is available in the *AF Analyzer* application only.
AF SINAD	*Signal to noise and distortion* ratio, i.e. the ratio of the receiver audio output level with its noise and distortion

	components to the level of the noise and distortion components alone, expressed in dB. This result is not available in the *Hum & Noise* application.
Hum & Noise	Audio output level with modulated RF signal relative to the audio output level with unmodulated RF signal. To determine the numerator, the receiver is modulated with an fixed audio tone. The Hum & Noise is expressed in dB; it is available in the *Hum & Noise* application only.
Sensitivity	RF level corresponding to the *Target SINAD* set in the *Control* tab of the *Connection Control* menu; see p. 4.31 ff. This result is available in the *Sensitivity* application only.

Below the measurement results, the frequency of the modulating test signal *(Mod. Generator* signal) used to determine the SINAD is indicated in an output field.

Limit Check A red output field and an arrow pointing upwards/downwards indicates that the measurement result exceeds the upper/lower limit set in the *Limits* tab of the *RX Tests* configuration menu, see p. 4.31.

Remote control

```
READ[:SCALar]:RXTests:<Applic>[:RESult]?
FETCh[:SCALar]:RXTests:<Applic>[:RESult]?
SAMPle[:SCALar]:RXTests:<Applic>[:RESult]?
CALCulate[:SCALar]:RXTests:<Applic>[:RESult]:MATChing:LIMit?
```

where `<Applic> = AFANalyzer | HNOise | SENSitivity`

Configurations The current configuration settings are indicated in the table in the right half of the *RX Tests* menu. From top to bottom, they form the following groups:

Pow. Lvl. / Voice Ch.	RF voice channel parameters: RF power and frequency. In the *Sensitivity* application, the *Start Pow. Level* for the search of the receiver sensitivity and the *Target SINAD,* both set via the *Pow. Lvl. / Voice Ch.* softkey, are indicated in addition.
Input Level	AF expected maximum input level as defined via the *Input Level* softkey and mode to set the max. input level.
AF Generator	Control and configuration of the AF generator corresponding to the *AF Generator* softkey.
Mod. Generator	Control and configuration of the modulation generator corresponding to the *Mod. Generator* softkey.

Remote control

`SOURce:RFGenerator:LEVel?` etc.
`[SENSe:]AFLevel:MAXimum?` etc.
`FETCh:AFGenerator:STATus?` etc.
`FETCh:MODGenerator:STATus?` etc.

Measurement Configurations (RX Tests Configuration)

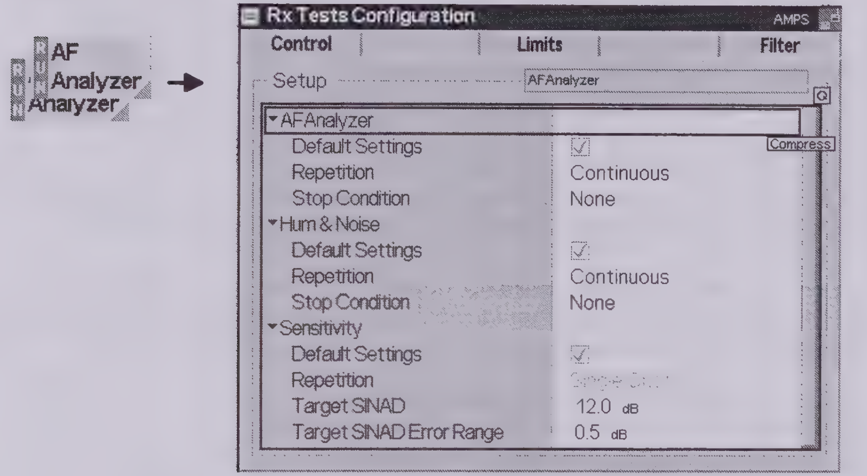
The popup menu *RX Tests Configuration* contains three tabs which determine the parameters of the *RX* tests including the error tolerances.

The popup menu *RX Tests Configuration* is activated by pressing the main softkey (labeled *AF Analyzer, Hum & Noise*, or *Sensitivity*, according to the application selected) in the measurement menu *RX Tests* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Measurement Control (RX Tests Configuration – Control)

The *Control* tab controls the *RX Tests* by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement



Setup: AFAnalyzer

AFAnalyzer	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
Hum & Noise	
Default Settings	☑
Repetition	Continuous
Stop Condition	None
Sensitivity	
Default Settings	☑
Repetition	Single Shot
Target SINAD	12.0 dB
Target SINAD Error Range	0.5 dB

Fig. 4-18 RX Tests Configuration – Control

The *Repetition* and *Stop Condition* settings can be defined separately for the three applications *AF Analyzer, Hum & Noise,* and *Sensitivity*. They comply with those of the menu *Control* in the menu group *TX Tests* (see page 4.10). In the remote-control commands, the keyword `TXTests:<Applic>` are to be replaced by `RXTests:<Applic>`.

Sensitivity The table section *Sensitivity* configures the iteration which is to determine the RF level corresponding to a particular target *signal to noise and distortion* ratio at the receiver output.

Target SINAD	Target value for the iteration in dB
Target SINAD Err. Range	Width of a level interval centered around the *Target SINAD* [Target – range, target + range]

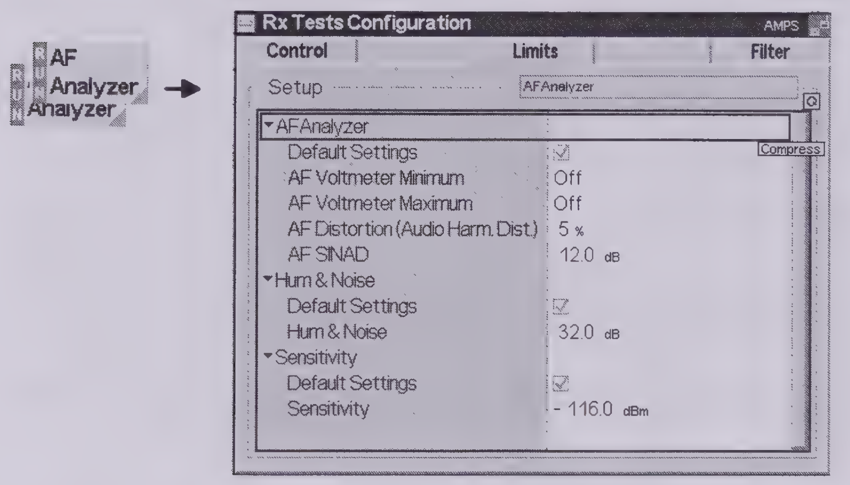
The *Sensitivity* measurement is successfully terminated as soon as the SINAD measured is within the range around the target SINAD defined by *Target SINAD Err. Range*. The search fails if no RF level corresponding to a deviation within the error range is found after a fixed maximum number of iteration steps.

Remote control

```
CONFigure:RXTests:SENSitivity:CONTrol:TSINad <Target>
CONFigure:RXTests:SENSitivity:CONTrol:TSERange <Range>
```

Limits (RX Tests Configuration – Limits)

The *Limits* tab defines upper and lower limits for the measured quantities in all three applications *(AF Analyzer, Hum & Noise,* and *Sensitivity)* of the *RX Tests* measurement group.



Setup: AFAnalyzer

AFAnalyzer	
Default Settings	☑
AF Voltmeter Minimum	Off
AF Voltmeter Maximum	Off
AF Distortion (Audio Harm. Dist.)	5 %
AF SINAD	12.0 dB
Hum & Noise	
Default Settings	☑
Hum & Noise	32.0 dB
Sensitivity	
Default Settings	☑
Sensitivity	- 116.0 dBm

Fig. 4-19 RX Tests Configuration – Limit Lines

Default All Settings

The *Default All Settings* switch assigns default values to all fields in the *Limits* tab (see chapter 6 of this manual). In addition, a default switch is provided for each of the three applications.

Remote control

```
CONFigure:RXTests:<Applic>:LIMit:DEFault  ON | OFF
```

where `<Applic> = AFANalyzer | HNOise | SENSitivity`

Limits

The table sections *AF Analyzer, Hum & Noise,* and *Sensitivity* define upper or lower limits for all measured quantities of corresponding applications. For an explanation of these quantities refer to the introduction at the beginning of section *RX Tests* on page 4.24 and to section *Measurement Results* on page 4.28 ff. The limits are to be interpreted as follows:

AF Voltmeter	Upper and lower limit *(Maximum/Minimum)* of the RMS audio voltage (in V) fed in via *AF IN*
AF Distortion	Upper limit of the AF harmonic distortion in %
AF SINAD	Lower limit of the SINAD in dB
Hum & Noise	Lower limit of the receiver Hum & Noise, expressed in dB
Sensitivity	Upper limit of the sensitivity level determined in the *Sensitivity* search application

If the limit check fails for one of the measured quantities the corresponding output field in the *RX Tests* menu is red and an arrow pointing upwards/downwards indicates that the upper/lower limit is exceeded.

Remote control

```
CONFigure:RXTests:AFANalyzer:LIMit
         <AFVoltmtr.>, <AFSINAD>, <AFDist>
CONFigure:RXTests:HNOise:LIMits <AFVoltmtr.>, <HNOise>
CONFigure:RXTests:SENSitivity:LIMits
         <AFVoltmtr.>, <AFSINAD>, <Sensitivity>
```

Sensitivity The table section *Sensitivity* configures the iteration which is to determine the RF level corresponding to a particular target *signal to noise and distortion* ratio at the receiver output.

Target SINAD	Target value for the iteration in dB
Target SINAD Err. Range	Width of a level interval centered around the *Target SINAD* [Target – range, target + range]

The *Sensitivity* measurement is successfully terminated as soon as the SINAD measured is within the range around the target SINAD defined by *Target SINAD Err. Range*. The search fails if no RF level corresponding to a deviation within the error range is found after a fixed maximum number of iteration steps.

Remote control `CONFigure:RXTests:SENSitivity:LIMits <ErrRange>`

Path Configuration (RX Tests Configuration – Filter)

The *Filter* tab configures the voice-processing equipment of the CMU and thus specifies the audio receive path for each of the three applications *(AF Analyzer, Hum & Noise,* and *Sensitivity)*.

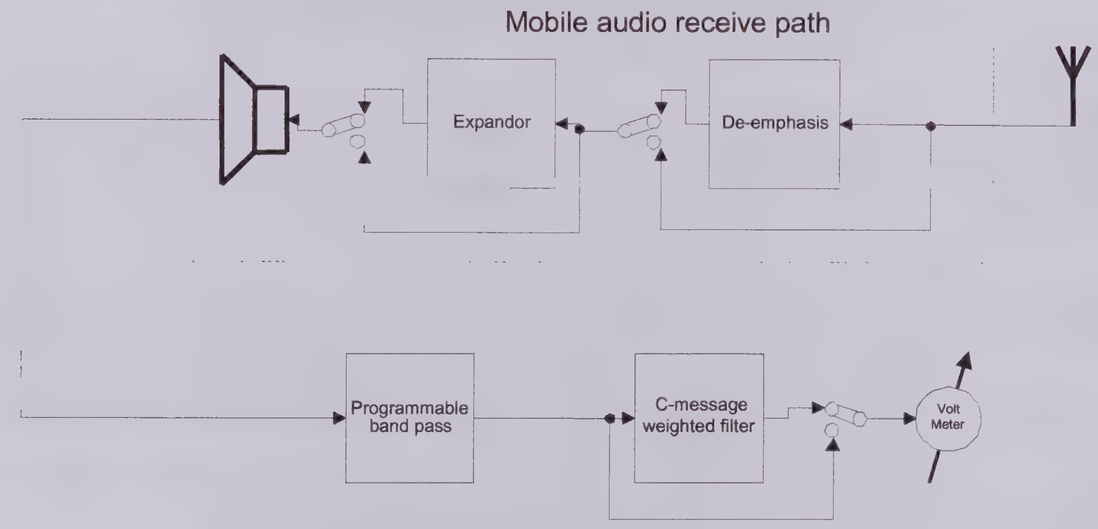


Fig. 4-20 Signal path for RX Tests

All functions of this menu are described in section *Path Configuration* (TX Tests Configuration – Filter) on page 4.13.

RX Audio Freq. Response

The menu group *RX Audio Freq. Response* provides the measurement of the electrical audio frequency response of the mobile phone receiver. The measurement results are displayed in the graphical measurement menu *RX Audio Freq. Response,* the popup menu *RX Audio Freq. Response Configuration* is used for configuration of the measurements.

The electrical audio frequency response is the ratio of the output of the MS receiver to the output of a reference de-emphasis. This quantity is measured as a function of the audio output frequency and expressed in dB. The test is to ensure that the audio output level is sufficiently close to the prescribed de-emphasis characteristic when the input frequency varies over the relevant range.

To speed up the measurement, the CMU generates a composite audio signal which represents the superposition of up to 20 individual, configurable tones with configurable frequency and level and is transmitted over the voice channel carrier signal. By analyzing the MS audio signal output, the electrical frequency response for all these tones can be determined simultaneously. With an appropriate configuration of the test tones, the behavior of the frequency response over the whole specified range of audio frequencies can be evaluated in a single measurement. The test setup is as shown in Fig. 4-15 on page 4.24.

Note: *It is advisable to switch off the mobile expandor as it might impair the* RX Audio Freq. Response *measurement.*

Measurement Menu (*RX* Audio Freq. Response)

The graphical measurement menu *RX Audio Freq. Response* shows the results of the receiver electrical audio frequency response test.

- The main softkey *RX Audio Freq. Response* indicates the status of the *RX Audio Freq. Response (RUN | HLT | OFF)* and opens the configuration menu *RX Audio Freq. Response Config* (press twice).
- The other softkeys to the right of the test diagram are combined with various hotkeys (e.g. the hotkeys *Voice Channel, Frequency,* and *Offset* belong to the softkey *Voice Channel).* If a softkey is selected and an associated hotkey pressed, a popup window will appear which indicates the current setting and enables an entry (for an example, see section *Measurement Menu (TX Tests)* on page 4.5 ff.).

The measurement menu *RX Audio Freq. Response* is opened via the main menu *Menu Select* (with the associated key at the front of the instrument) or using the *RX Audio Freq. Response* hotkey.

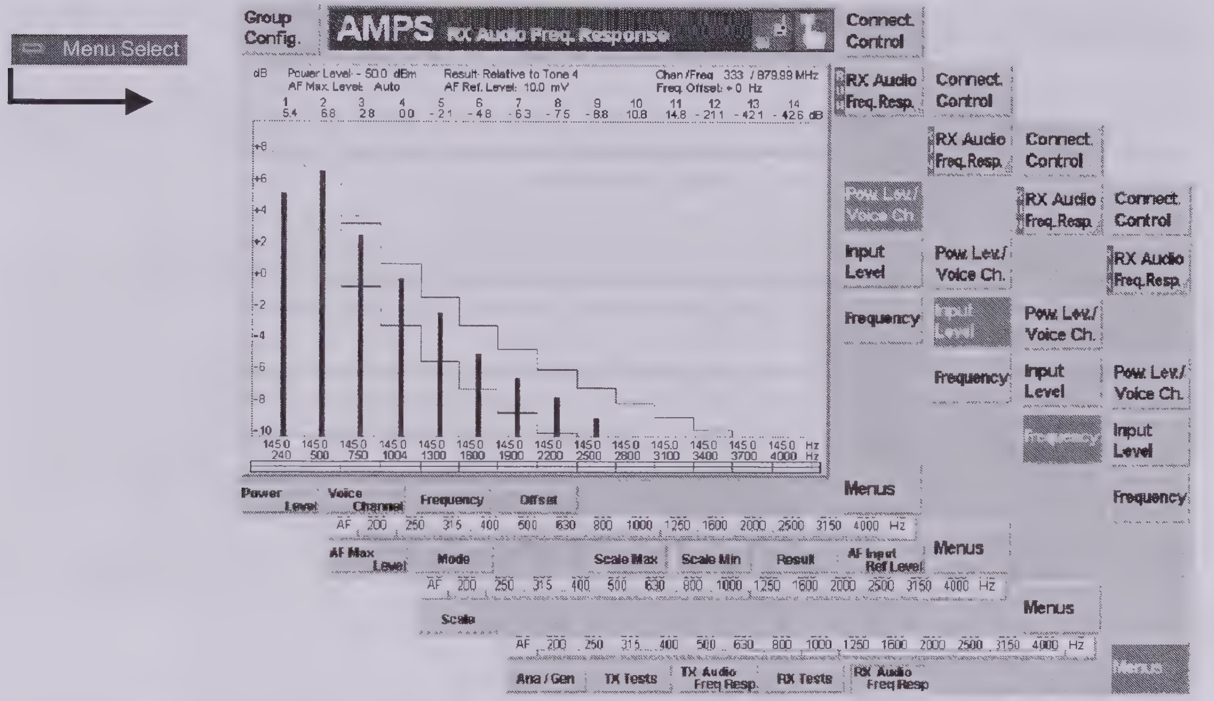

Power Level: - 50.0 dBm
AF Max. Level: Auto
Result: Relative to Tone 4
AF Ref. Level: 10.0 mV
Chan /Freq 333 / 879.99 MHz
Freq. Offset: + 0 Hz

Fig. 4-21 Measurement menu RX Audio Freq. Response

Test Settings

Most of the test settings in the *RX Audio Freq. Response* menu are identical with those in the *TX Audio Freq. Response* menu. The differences reflect the different test setup and signal paths, in particular the type of input signal analyzed:

- In the TX audio frequency response measurement, the (modulated) RF signal.
- In the RX audio frequency response measurement, the audio signal fed in via *AF IN*.

For all other settings refer to section *Test Settings* on page 4.17.

Input Level

The *Input Level* softkey configures the expected AF input level and sets the y-axis scale of the test diagram.

AF Max. Level

The *AF Max. Level* hotkey determines the maximum expected AF input level.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]AFLEVel:MAXimum <Level>`

Mode

The *Mode* hotkey determines how the maximum audio input level is defined.

Manual	Manual input of audio reference level
Auto	Automatic setting according to the level of the applied AF input signal. This is more convenient but may also be more time-consuming than the manual setting.

See section *Input Level (Group Configuration – Input Level)* on page 4.48.

Remote control `[SENSE:]AFLEVel:MODE MANual | AUTOmatic`

Result	The *Result* hotkey defines the reference value for all measurement results. This corresponds to the 0 dB reference line in the diagram.

Relative to AF Ref. Lev. [dB]	All results are referenced to a particular reference level
Relative to Tone 1 [dB]	All results are referenced to the measurement result at tone 1 (if available)
...	
Relative to Tone 20 [dB]	All results are referenced to the measurement result at tone 20 (if available)

The reference level is defined via the *AF Input Ref. Level* hotkey described below. The measurement is taken at up to 20 audio frequencies (tone 1 to 20) which can be defined and switched on or off in the *Freq./Level* tab of the configuration menu (see page 4.37 ff.).

Remote control `CONFigure:RXAFresp:CONTrol:RREQuest  RDEV | TON<nr>`

AF Input Ref. Level The *AF Input Ref. Level* hotkey defines an audio reference level.

The reference level is entered as an RMS voltage (in mV) and defines the 0 dB line of the test diagram provided that this is selected as an option via the *Result* hotkey (see above).

Remote control `CONFigure:RXAFresp:CONTrol:RLEVel <Voltage>`

Measurement Results

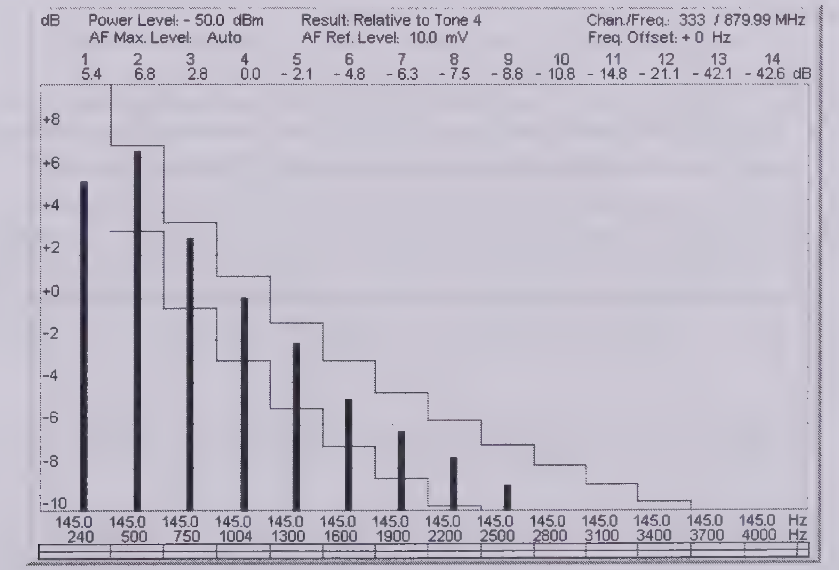
In the *RX Audio Freq. Response* measurement, the frequency response of the MS receiver at up to 14 out of 20 different audio input frequencies is displayed. These results and the test settings are indicated in two parameter lines and the actual test diagram (bar graph):

Parameter lines

Test tone no. and frequency response

Bar graph with upper and lower limit lines

Test tone voltage and frequency



```
dB   Power Level: - 50.0 dBm     Result: Relative to Tone 4        Chan./Freq.: 333 / 879.99 MHz
     AF Max. Level:  Auto        AF Ref. Level: 10.0 mV            Freq. Offset: + 0 Hz
       1     2     3     4      5      6      7      8      9      10      11      12      13      14
      5.4   6.8   2.8   0.0   - 2.1  - 4.8  - 6.3  - 7.5  - 8.8  - 10.8  - 14.8  - 21.1  - 42.1  - 42.6 dB
    145.0 145.0 145.0 145.0  145.0  145.0  145.0  145.0  145.0  145.0   145.0   145.0   145.0   145.0 Hz
     240   500   750  1004   1300   1600   1900   2200   2500   2800    3100    3400    3700    4000 Hz
```

Fig. 4-22 Display of measurement results (RX Audio Freq. Response)

Parameter lines The first parameter line contains the following settings:

Power Level	Maximum RF input level set as in *Input Level - Mode* (see section *Input Level (Group Configuration – Input Level)* on page 4.48)
Result	Reference value for all levels as set via the *Result* hotkey (see p. 4.35)
Chan./Freq.	RF channel and associated frequency

The second parameter line contains the following settings:

AF Max. Level	Maximum expected audio input level at AF IN as set via the *AF Max. Level* hotkey (see p. 4.18)
AF Ref. Level	Reference level as set via the *AF Input Ref. Level* softkey (see p. 4.35)
Freq. Offset	Frequency offset relative to the nominal channel frequency

Remote control The settings are read out using the query corresponding to the setting command (setting command with appended question mark).

Bar graph The bar graph shows the receiver audio frequency response in dB at a maximum of 14 out of 20 different audio frequencies corresponding to a continuous range of test tones configured in the *Freq./Level* tab of the configuration menu (see p. 4.22 ff.). If a test tone is disabled in the configuration menu, the corresponding bar is omitted.

Frequency axis (abscissa) The range of test tones (no. 1 to 14, 2 to 15 etc.) to be viewed can be selected via the *Frequency* softkey. The bars representing the frequency response at the different tones are equidistantly distributed over the whole diagram width. This optimizes the readability of the diagram but implies that the abscissa scale is not necessarily linear. Therefore, the frequency and voltage of every single test tone is displayed below the frequency axis.

Frequency response axis (ordinate) The ordinate can be arbitrarily scaled by setting a maximum and minimum value (both in dB). With a fixed ordinate, the adjustable 0 dB reference line (see *Result* softkey on p. 4.18) allows to shift the whole diagram vertically.

Remote control `READ:ARRay:RXAFresp[:RESult]?` etc.
`READ[:SCALar]:RXAFresp[:RESult]:TONE<nr>?` etc.

Limit Check The upper and lower limit lines for each test point defined in the *Limit Lines* tab of the configuration menu (see p. 4.21) yield the two red step functions in the diagram. If the limit check fails at a particular test point the corresponding section of the red bar across the bottom of the diagram is shifted upwards.

Remote control

```
CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE]:TONE?
CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE]
:TONE<nr>?
```

Measurement Configurations (*RX Audio Freq. Response* Configuration)

The popup menu *RX Audio Freq. Response Configuration* contains four tabs which determine the parameters of the *RX Audio Freq. Response* measurement including the error tolerances.

The popup menu *RX Audio Freq. Response Configuration* is activated by pressing the main softkey *RX Audio Freq. Resp.* in the measurement menu *RX Audio Freq. Response* twice. It is possible to change between the tabs by pressing the associated hotkeys.

Measurement Control (RX Audio Freq. Response Configuration – Control)

The *Control* tab controls the *RX Audio Freq. Response* by determining

- The *Repetition* mode
- The *Stop Condition* for the measurement
- A settling time for the measurement after a change of the Modulation generator settings *(Mod. GeneratorLead)*

Besides, it configures the measurement diagram by adding or removing the *Grid*.

All functions of this menu are described in section *Measurement Control (TX Audio Freq. Response* Configuration – Control) on page 4.20. In the remote control commands, the keyword `TXAFresp` is to be replaced by `RXAFresp`.

Limit Lines (RX Audio Freq. Response Configuration – Limit Lines)

The *Limit Lines* tab defines upper and lower limits for the audio frequency response at all test tones and enables or disables the limit check.

All functions of this menu are described in section *Limit Lines (TX Audio Freq. Response Configuration – Limit Lines)* on page 4.21. In the remote control commands, the keyword `TXAFresp` is to be replaced by `RXAFresp`.

Test Tones (*RX Audio Freq. Response* Configuration – Freq./Dev.)

The *Freq./Dev.* tab configures the audio test signal to be applied to the input of the mobile station receiver. This signal is composed of up to 20 test tones with different frequencies and frequency deviations.

All functions of this menu are described in section *Limit Lines (TX Audio Freq. Response Configuration – Limit Lines)* on page 4.21. Note that frequency deviations are assigned to the individual tones instead of levels and that either separate deviations for each tone or a total frequency deviation can be defined (the *Deviation Selection* parameter can be set to either *Use separate dev. for each tone* or *Use total freq. deviation;* there is no equivalent for *Use AF Level Search Result)*. In the remote control commands, the keyword `TXAFresp` is to be replaced by `RXAFresp`.

Path Configuration (*RX Audio Freq. Response* Configuration – Filter)

The *Filter* tab configures the voice-processing equipment of the CMU and thus specifies the method of measurement for the *RX Audio Freq. Response* tests. See also introduction at the beginning of section *TX Tests* on page 4.4.

All functions of this menu are described in section *Path Configuration* (TX Tests Configuration – Filter) on page 4.13. In the remote control commands, the keyword `TXAFresp` is to be replaced by `RXAFresp`.

Connection Control

The menu group *Connection Control* consists of three popup menus which configure the inputs and outputs of the CMU and the respective signals in the function group *AMPS-MS Non Signalling*.

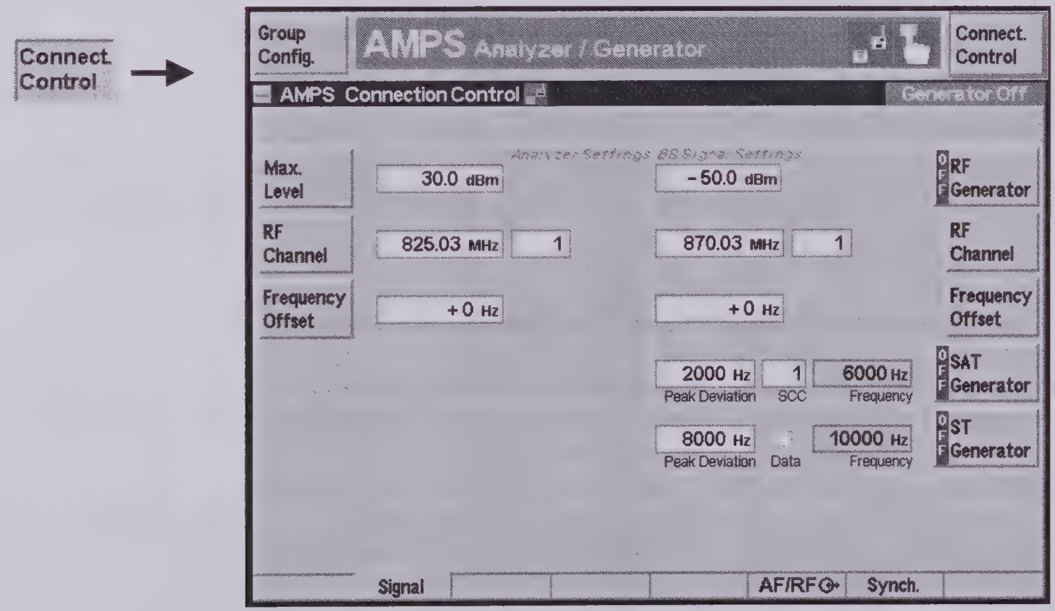
The menu group is activated via the softkey *Connect. Control* to the right of the header of each measurement menu. The individual popup menus *(Signal, AF/RF ↔ and Synch.)* can be accessed via the hotkeys at the lower edge of the screen.

Control of Input and Output Signals (Connection Control – Signal)

The popup menu *Signal* configures the signals generated by the RF generator of the CMU (right side) and those which can be measured by the instrument (left side). The following settings are possible in three panels:

- Maximum level *(Max. Level)*, RF channel *(Voice Channel)*, and frequency offset *(Frequency Offset)* of the signal analyzed by the CMU *(panel Analyzer Settings)*.
- Power *(Power Level)*, RF channel *(Voice Channel)*, and frequency offset *(Frequency Offset)* of the signal generated *(panel BS Signal Settings)*.
- Parameters of the supervisory audio tone *(SAT)* and the signalling tone *(ST)* provided by the CMU.

The settings of the *Analyzer Settings* and *BS Signal Settings* panels are also available in the main menu *Analyzer/Generator* (see page 4.2).



Max. Level: 30.0 dBm (Analyzer Settings); −50.0 dBm (BS Signal Settings)

RF Channel: 825.03 MHz, 1 (Analyzer Settings); 870.03 MHz, 1 (BS Signal Settings)

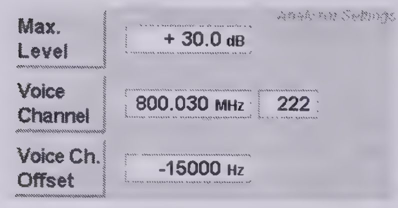
Frequency Offset: +0 Hz (Analyzer Settings); +0 Hz (BS Signal Settings)

SAT Generator: Peak Deviation 2000 Hz, SCC 1, Frequency 6000 Hz

ST Generator: Peak Deviation 8000 Hz, Data, Frequency 10000 Hz

Fig. 4-23 Connection Control – input and output signals

Panel Analyzer Settings



Analyzer Settings

Max. Level: + 30.0 dB

Voice Channel: 800.030 MHz 222

Voice Ch. Offset: -15000 Hz

The panel *Analyzer Settings* contains three softkeys which specify the signals measured by the CMU, i.e.:

- The maximum expected input level *(Max. Level)*
- The channel number or frequency *(Voice Channel)*
- An additional *Frequency Offset* shifting the RF frequency

Max. Level

The *Max. Level* softkey sets the maximum expected input level.

This parameter is identical with the maximum input level set in the popup menu *Group Configuration* (see page 4.48). The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section *AF/RF Connectors (Connection Control – Connector/Ext. Att.)* on page 4.44), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Input levels exceeding the *Max. Level* can not be measured; the corresponding measurement result fields indicate "– – –", and a message *Overload at Connector <Connector_no>* pops up.

The input field is activated when the softkey is pressed once (softkey selection, *Max. Level* can be edited). Pressing the selected softkey once again calls up the popup menu *Group Configuration* (see page 4.48) with the tab *Input Level*. The *Group Configuration* menu can be closed on pressing *Max. Level* for a third time.

Remote control `[SENSe:]LEVel:MAXimum <Level>`

Voice Channel

The *Voice Channel* softkey defines the channel number (if applicable) or frequency of the measured voice signal.

In the *Non Signalling* mode, RF frequencies can be entered in multiples of 10 kHz. If the frequency entered does not correspond to a designated AMPS channel number, "---" is indicated in the associated channel input field. On turning the rotary knob, the current frequency is incremented or decremented by 30 kHz.

The assignment of channel numbers and frequencies is specified in the AMPS standard for both signal directions. Therefore, inside the bands, it is sufficient to enter only one value (frequency **or** channel number), the other one is automatically determined by the CMU.

The following tables contain the channel assignment in the reverse path (i.e. from mobile to base station/CMU). Channel numbers which are not listed in the tables are not assigned.

Table 4-1 AMPS analog voice channels in the reverse path (mobile phone transmit)

Center Frequency / [MHz]	Channel	Band
0.03 824.01	--- 990	not used
824.04 825	991 1023	A'' (1 MHz) Expanded Spectrum
825.03 834.99	1 333	A (10 MHz) Non-Expanded Spectrum
835.02 844.98	334 666	B (10 MHz) Non-Expanded Spectrum
845.01 846.48	667 716	A' (1.5 MHz) Expanded Spectrum
846.51 848.97	717 799	B' (2.5 MHz) Expanded Spectrum
849 MHz 2700 MHz	--- ---	not used

Remote control

```
[SENSe:]RFANalyzer:FREQuency:UNIT <Unit>
[SENSe:]RFANalyzer:FREQuency <Frequency>
```

Frequency Offset

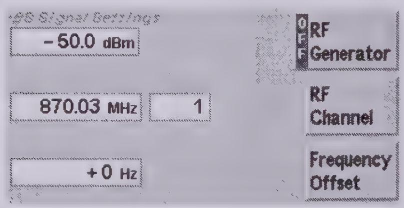
The *Frequency Offset* softkey modifies the analyzer frequency set via *Voice Channel* by a positive or negative offset value.

This enables fine-tuning of the frequency measured by the CMU, e.g. in order to simulate a Doppler shift (caused by a relative movement between mobile and base station) or de-tuning of the mobile.

Remote control

```
[SENSe:]RFANalyzer:FREQuency:OFFSet <Offset>
```

Panel BS Signal Settings


- 50.0 dBm

870.03 MHz 1

+ 0 Hz

The *BS Signal Settings* panel contains three softkeys which define the signals generated by the RF generator:

- The maximum generator level (main softkey *Power Level)*
- The channel number and corresponding frequency *(Voice Channel)*
- An additional frequency offset *(Frequency Offset)*

Power Level

The softkey *Power Level* defines the generator level and indicates the operating status of the RF generator *(ON | OFF)*.

The level is entered in dBm. The RF generator can be switched on or of after softkey selection (press once) using the *ON/OFF* key.

Remote control

```
INITiate:RFGenerator; ABORt:RFGenerator
FETCh:RFGenerator:STATus?
```

External attenuation

If an external gain or attenuation is used and reported to the instrument (see softkey *Ext. Att. Output*) the RF generator level is adjusted to maintain the commanded power after the attenuation or gain. As a consequence, all levels indicated are referenced to the input of the DUT and no longer correspond to the actual level at the output connectors of the CMU (see section *AF/RF Connectors (Connection Control – Connector/Ext. Att.)* on page 4.44). The default value for the generator power is also shifted provided that the generator can output the required power, compensating for the external attenuation or gain.

Error messages

If the level defined for *RF Level* is too high or too low, a window will appear with the error message *"<RF_Level> is out of range. <Permissible max. value> is limit."* and three fields:

Accept	Permissible max. value is accepted as *Max. Level*
Re-edit	The *Max. Level* is entered once again
Cancel	The last valid input is maintained

When switching over to a different output, the current value of *Max. Level* is automatically adapted, if required:

- Towards lower values to the maximum permissible value of the new output
- Towards higher values to the minimum value of the new output

Remote control

`SOURce:RFGenerator:LEVel <Level>`

Voice Channel

The *Voice Channel* softkey defines the channel number (if applicable) or the frequency of the generated RF signal.

RF frequencies can be entered in multiples of 30 kHz. The assignment of channel numbers and frequencies is specified in the AMPS standard for both signal directions. Therefore, inside the bands, it is sufficient to enter only one value (frequency **or** channel number), the other one is automatically determined by the CMU.

In *Non Signalling* mode, the measurements may also be taken outside the AMPS band. If an out-of-band frequency is entered, the associated channel field indicates '---'.

The following tables contain the channel assignment in the forward path (from the base station/CMU to the mobile phone). The channel frequencies are shifted by +45 MHz compared with the reverse path (duplex spacing, see above, *Panel Analyzer Settings)*. Channel numbers which are not listed in the tables are not assigned.

Table 4-2 AMPS analog voice channels in the forward path (base station transmit)

Center Frequency / [MHz]	Channel	Band
0.03 869.01	--- 990	not used
869.04 870	991 1023	A" (1 MHz) Expanded Spectrum
870.03 879.99	1 333	A (10 MHz) Non-Expanded Spectrum
880.02 889.98	334 666	B (10 MHz) Non-Expanded Spectrum
890.01 891.48	667 716	A' (1.5 MHz) Expanded Spectrum
891.51 893.97	717 799	B' (2.5 MHz) Expanded Spectrum
894 2700	--- ---	not used

Remote control

```
SOURCe:RFGenerator:FREQuency:UNIT <Unit>
SOURCe:RFGenerator:FREQuency <Frequency>
```

Frequency Offset

The *Frequency Offset* softkey defines an offset shifting the generated voice channel frequency from its nominal value.

This enables fine-tuning of the RF frequency generated by the CMU, for example for simulating a Doppler shift (due to a relative movement between mobile and base station) or de-tuning of the mobile.

Remote control

```
SOURCe:RFGenerator:FREQuency:OFFSet <FrequencyOffset>
```

SAT and ST

SAT

The *SAT* softkey configures the supervisory audio tone provided by the CMU and transmitted over the voice channel.

In the network, the supervisory audio tone (SAT) is transmitted over the forward voice channel (CMU/base station to mobile) and transponded by the mobile back to the base station. Its purpose is to indicate the continuity of a call and to identify the base station with which the mobile station is communicating. To distinguish different base stations, three different SAT color codes *(SCC)* corresponding to three SAT frequencies f_{SAT} are defined in AMPS:

SCC = 0	f_{SAT} = 5970 Hz
SCC = 1	f_{SAT} = 6000 Hz
SCC = 2	f_{SAT} = 6030 Hz

The SAT must be switched on to perform several of the tests specified in the standard.

Peak Deviation

The *Peak Deviation* input field defines the maximum frequency deviation that the CMU uses to transmit the SAT to the mobile phone. The *SAT Peak Deviation* in the reverse path (mobile phone to base station) can be measured in the *TX Tests* measurement menu, see p. 4.5 ff.

SCC

The *SCC* input field defines the SAT color code. The frequency corresponding to the SCC selected is indicated to the right of the *SCC* input field.

Remote control

```
INITiate:SAT; ABORt:SAT
FETCh:SAT:STATus?
SOURce:SAT:PEAKdev <Deviation>
[SENSe:]SAT:SCC <Code>
```

ST

The *ST* softkey configures the signalling tone or the wide-band data provided by the CMU and transmitted over the voice channel.

In the network, the signalling tone (ST) is transmitted over the reverse voice channel by the mobile and is used to acknowledge certain commands received from the base station. The frequency of the ST is fixed to 10 kHz.

Peak Deviation

The *Peak Deviation* input field defines the maximum frequency deviation that the CMU uses to transmit the ST. The *ST Peak Deviation* in the reverse path (mobile phone to base station) can be measured in the *TX Tests* measurement menu, see p. 4.5 ff.

Frequency

The *Frequency* field indicates the fixed ST frequency of 10 kHz.

Data

If the *Data* checkbox is enabled, the ST signal is replaced by the 10 kilobit/s Manchester-encoded data signal (wideband data) specified in the standard. In the network, wideband data is used for cellular system signalling and control.

Remote control

```
INITiate:ST; ABORt:ST
FETCh:ST:STATus?
SOURce:ST:PEAKdev <Deviation>
[SENSe:]ST:DAT OON | OFF
```

AF/RF Connectors (Connection Control – Connector/Ext. Att.)

The *AF/RF* ⊸ tab configures the RF connectors. This includes the setting of

- The RF input and output of the CMU *(RF Output, RF Input)*
- An external attenuation at the connectors *(Ext. Att. Output, Ext. Att. Input)*

Connect. Control →

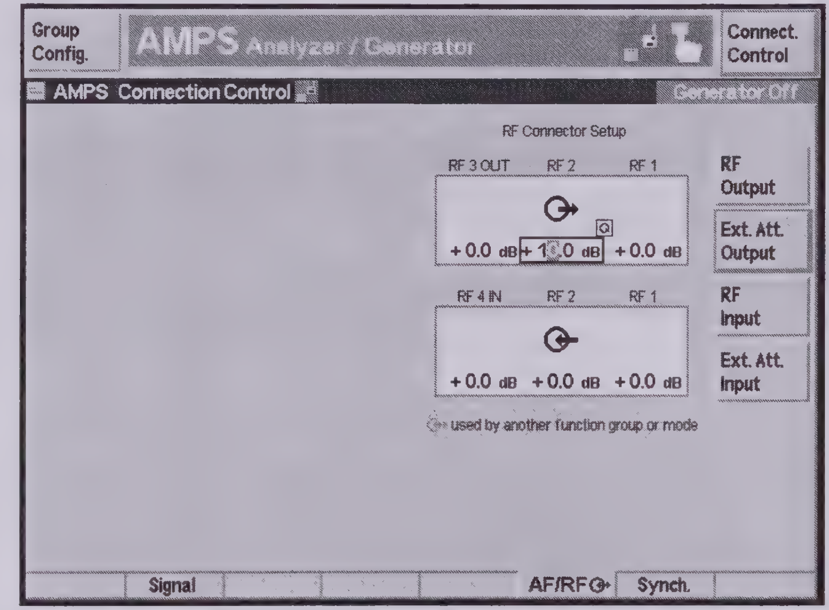


Fig. 4-24 Connection Control – RF connectors

RF Output	The *RF Output* softkey defines which of the three connectors RF 1, RF 2 and RF 3 OUT is to be used as RF output connector.

The selected RF output is indicated by a ⊸ symbol.

Note: *Input and output connectors can be arbitrarily combined. The bidirectional connectors RF 1 and RF 2 can be selected as RF inputs and outputs at the same time.*

The LEDs on the front panel are only „on“ (light) if the generator is switched on.

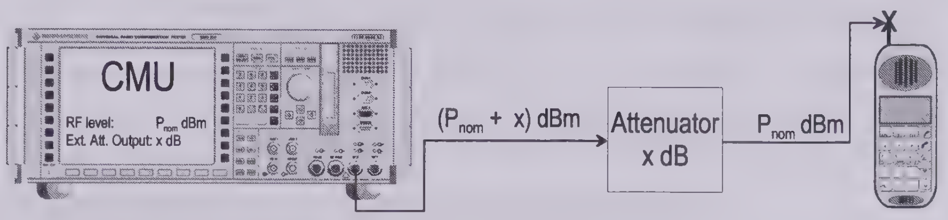
Remote control `OUTPut[:STATe] RF1 | RF2 | RF3`

Ext. Att. Output

The softkey *Ext. Att. Output* defines an external attenuation (or gain, if the value is negative) at the selected RF output.

Input of an external attenuation is suitable if, e.g., a path attenuation (cable) is included in the test setup, which is to be corrected by an increased signal level.

If an external attenuation is defined, the output signal level is referenced to the input of the DUT, the generator level is therefore shifted with respect to the actual level at the input connector of the CMU. The default value for the generator power and the level ranges for the RF outputs are also shifted provided that the generator can output the required power, compensating for the external attenuation or gain. Otherwise it is adapted to the level closest to the shifted default value.



Remote control `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]`

RF Input

The *RF Input* softkey determines which of the three connectors RF 1, RF 2 and RF 4 IN is to be used as RF input connector.

The selected RF output is indicated by a ⊖ symbol. Input and output connectors can be arbitrarily combined.

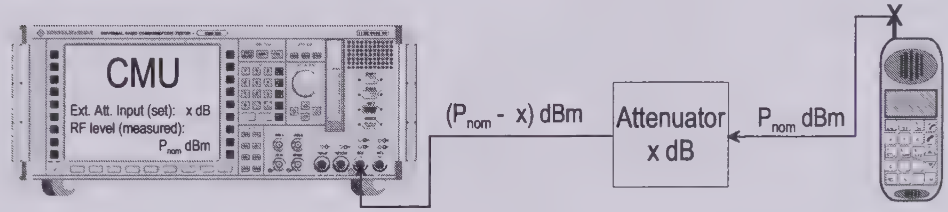
Remote control `INPut[:STATe] RF1 | RF2 | RF4`

Ext. Att. Input

The softkey *Ext. Att. Input* enters the value of the external attenuation (or gain) at the selected RF input.

Input of an external attenuation is required if, for example, external attenuator pads are used for protection of the sensitive RF inputs of the CMU or if a path attenuation is included in the test setup.

If an external input attenuation is reported to the instrument, all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.



Note: *The LEDs on the front panel are only "on" (light) if the measurement is active.*

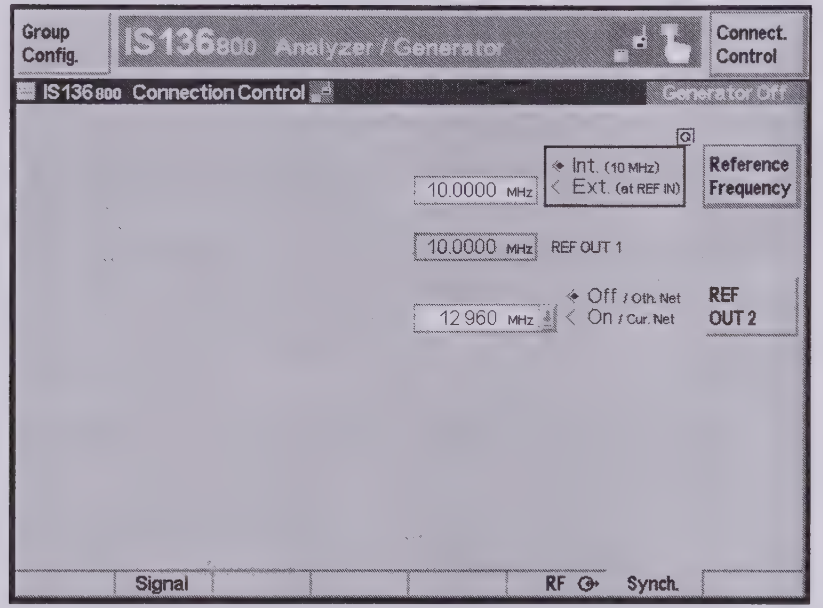
Remote control `[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]`
`SOURce:CORRection:LOSS:OUTPut<nr>[:MAGNitude]`

Reference Frequency (Connection Control – Synch.)

The *Synch.* tab defines the reference signals for synchronization. This includes

- The internal or external *Reference Frequency*
- The output mode for the network-specific system clock *(REF OUT 2)*

Connect. Control →



◆ Int. (10 MHz)
< Ext. (at REF IN)
10.0000 MHz

10.0000 MHz REF OUT 1

◆ Off / Oth. Net
< On / Cur. Net
12.960 MHz

Fig. 4-25 Connection Control – Synchronization

Reference Frequency

The *Reference Frequency* softkey determines the source and the frequency of the reference signal.

The associated field permits to select between two alternatives:

Int. (10 MHz)	internal synchronization with 10 MHz (TCXO or OCXO, CMU-B11/-B12) applied to output REF OUT 1 at the rear of the instrument.
Ext. (at REF IN)	external reference signal to be fed in via input *REF IN* and applied to output REF OUT 1 at the rear of the instrument.

The frequency of the external reference signal must be entered in the input field next to the *External* button.

The reference signal used is applied to output *REF OUT 1* so that it can be fed to other instruments as well. It can be used for synchronization to another instrument.

Notes:

1. *With external synchronization selected, the header cyclically displays a warning if no synchronization has been performed e.g. because of missing or faulty input signal.*
2. *In the case of external synchronization with squarewave signals (TTL) ensure correct signal matching to avoid reflections. Otherwise, resulting overshoots may cause trigger problems at the CMU input. A possible remedy is to use a lowpass filter or an attenuator pad directly at the CMU input. Correct synchronization may be checked by comparing the signal REF OUT 1 or REF OUT 2 with the input signal.*
3. *This configuration is valid in **all** CMU function groups.*

Remote control
```
CONFigure:SYNChronize:FREQuency:REFerence:MODE <ON | OFF>
CONFigure:SYNChronize:FREQuency:REFerence <Frequency>
```

REF OUT 2

The softkey *REF OUT 2* configures a network-specific system clock REF OUT 2 to be fed to the output *REF OUT 2* at the rear of the instrument.

The associated field permits to select between two alternatives:

OFF (other network)	The clock frequency of the current function group is not fed to the output *REF OUT 2*. With this setting the system clock of another active function group (e.g. the 1800 MHz hyperband while the current hyperband is 800 MHz) is still applied to *REF OUT 2* provided that the output *REF OUT 2* is switched on in the other function group. However, if *REF OUT 2* is explicitly switched over from *On* to *Off* the clock signal is definitely removed.
On (current network)	The network-specific system clock of the current function group is fed to output REF OUT 2. The system clock of any other function group applied to REF OUT 2 before is replaced.

The following clock frequencies may be selected:

39.00 MHz, 19.50 MHz, 13.00 MHz, 9.75 MHz 7.80 MHz

(The values are calculated according to the formula $F_{out} = 39.00\ MHz / n$ where $n = 1, ..., 5$)

The clock frequency can be used to synchronize other instruments.

Remote control
```
SOURce:DM:CLOCk:STATe ON | OFF
SOURce:DM:CLOCk:FREQuency <Frequency>
```

Group Configuration

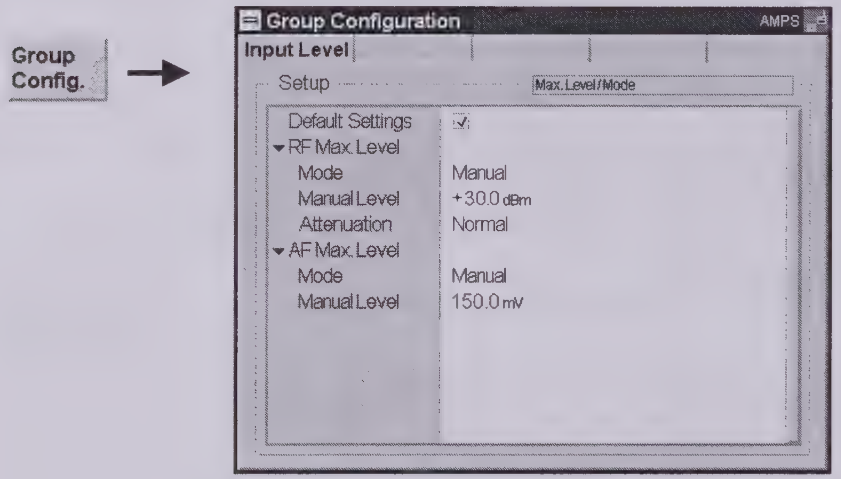
The popup menu *Group Configuration* configures the function group *AMPS-MS Non Signalling* globally, i.e., it provides settings that are used as default values for all measurement menus within the function group. Most of these settings can be overwritten in the individual graphical measurement menus using softkeys and popup input fields.

The popup menu *Group Configuration* can be activated by pressing the softkey *Group Config.* at the top left in each measurement menu. It is possible to change between the tabs by pressing the associated hotkeys.

Input Level (Group Configuration – Input Level)

The tab *Input Level* provides settings for the measured AF and RF input level (see also section *Connection Control* on page 4.38 ff.):

- Maximum expected value *(Max. Level),*
- Attenuation or gain *(Attenuation).*



Default Settings	☑
RF Max. Level	
Mode	Manual
Manual Level	+30.0 dBm
Attenuation	Normal
AF Max. Level	
Mode	Manual
Manual Level	150.0 mV

Fig. 4-26 Group Configuration – Input level

Default Settings The Default Settings switch overwrites all settings in the *Input Level* tab with their default values. See command description in chapter 6.

Max Level – Mode The *Max. Level* table section sets the maximum input level which can be measured. The maximum input level is displayed next to the softkey *Max. Level* in the main menu *Analyzer/Generator* (see page 4.2).

Manual Manual input of maximum input level

External attenuation The range of values depends on the RF input used. If an external input attenuation is reported to the instrument (see section AF/RF Connectors (Connection Control – Connector/Ext. Att.) on page 4.44), all levels measured are referenced to the output of the DUT and therefore shifted with respect to the actual level at the input connectors of the CMU. The level ranges for the input connectors are shifted as well.

Input levels exceeding the *Max. Level* can not be measured; the corresponding measurement result fields indicate “– – –“.

Error messages

If the value determined for *Max. Level* is too high or too low, a window with the error message *"<Max_Level> is out of range. <permissible max. value> is limit.*" and three fields will appear:

Accept	The permissible max. value is accepted as Max. Level
Re-edit	Max. Level is entered once again
Cancel	The last valid input value is maintained

When switching over to another input, the current value of *Max. Level* is automatically adapted, if required:

- Towards lower values to the maximum value of the new input
- Towards upper values to the minimum value of the new input

Remote control `[SENSe:]LEVel:MAXimum <Level>`

Attenuation

The *Attenuation* field defines how the RF analyzer of the CMU is tuned to meet the requirements of the current measurement type. In general, a compromise between the acceptable noise level in the displayed result and the contribution of internally generated distortion must be reached.

Normal	Mixer level in normal range,
Low noise	Mixer level enhanced by +10 dB (full dynamic range of CMU, therefore recommended for power measurements),
Low distortion	Mixer level reduced by –10 dB (high intermodulation spacing, therefore recommended for modulation measurements).

The *Attenuation* setting permits the CMU to be adapted to the requirements of the measurement. The advantages and disadvantages of the settings *Low noise* and *Low distortion* are listed in the following table.

	Advantages	**Disadvantages**
Low noise	Low noise high dynamic range	No RF overload reserve Risk of intermodulation
Low distortion	High intermodulation spacing	Lower dynamic range

Remote control `[SENSe:]LEVel:ATTenuation  NORMal | LNOise | LDIStortion`

AF Max Level

The *AF Max. Level* table section sets the maximum expected AF input level. Levels exceeding this value can not be measured.

Manual	Manual input of maximum input level
Auto	Automatic setting of maximum input level *(autoranging)* according to average power of applied AF signal (plus an appropriate overload margin)

Error messages

If the value set for *Max. Level* is too high or too low, a window with the error message *"<Max_Level> is out of range. <permissible max. value> is limit.*" and three fields will appear:

Accept	The permissible max. value is accepted as Max. Level,
Re-edit	Max. Level is entered once again,
Cancel	The last valid input value is maintained.

Remote control `[SENSe:]AFLEVel:MAXimum <Level>`

AMPS Mobile Tests (Signalling Mode)

This section provides detailed information on the measurement and configuration menus defined in function group *AMPS-MS Signalling*. It is organized like a typical measurement session including the following stages:

1. Call setup to the mobile station *(Connection Control – Signal)*
2. Overview of measurements and general settings *(Overview)*
3. Measurement menus *(TX Tests, TX Audio Freq. Response, RX Tests, RX Audio Freq. Response):* Performance of the measurements, output of measurement results, specific measurement configurations
4. Global configurations *(Connection Control, Group Configuration)*

The most important menus of the function group *AMPS-MS Signalling* are shown in an overview at the end of chapter 3 in the present manual.

A lot of menus and controls are similar or identical in the two operating modes for *AMPS-MS* with and without signalling. These menus will only be presented with a summary explanation; the detailed description is found in the section *AMPS-MS Non Signalling*.

Call Setup
(Connection Control – Signalling)

The menu group *Connection Control* controls signalling (call setup and release, services, signalling parameters) and configures the inputs and outputs with the external attenuation values and the reference frequency.

As the measurement mode requires an existing connection to the mobile station, the tabs controlling the call setup (*Connection Control – Signalling)* appear immediately after selection of the function group *AMPS-MS Signalling* in the *Menu Select* menu. Alternatively, the *Connection Control* menu can be called up by pressing the softkey *Connect. Control* at the top right in every measurement menu; the individual tabs can be accessed via the hotkey bar at the lower edge of the screen. By pressing the *Escape* key, the *Connection Control* menu is closed and the CMU changes to the measurement mode.

In the following the first two tabs *Connection Control – Signalling* displayed immediately after activation of the function group are described. A description of the other tabs of the *Connection Control* menu is relegated to the end of this chapter (see section *Signalling Control in the Registered State* on page 4.63).

The term signalling denotes all procedures that are necessary for call setup and release and for control of a connection in the mobile radio network. In the case of AMPS mobile station tests, a distinction is made between five different signalling states:

Signal Off	CMU transmits no signal
Signal On	CMU outputs a AMPS control channel signal to which a mobile station can synchronize
Registered	Registration of the mobile station completed
Alerting	Mobile is being called by the CMU (after registration or without registration)
Call Established	Call connection to mobile station established, mobile picked up

A number of control commands which can be initiated both by the CMU *(Call to MS)* and by the mobile station *(Call from MS)* switch between these states (in Fig. 4-1, processes initiated by the mobile station are indicated by dashed lines).

Many applications in function group *AMPS-MS Signalling* are only possible or useful in a particular signalling state (for example, a handoff between various networks requires an existing connection between CMU and mobile station, i.e. it is only possible in the *Call Established* state). Accordingly, the *Connection Control* menus may vary depending on the signalling state.

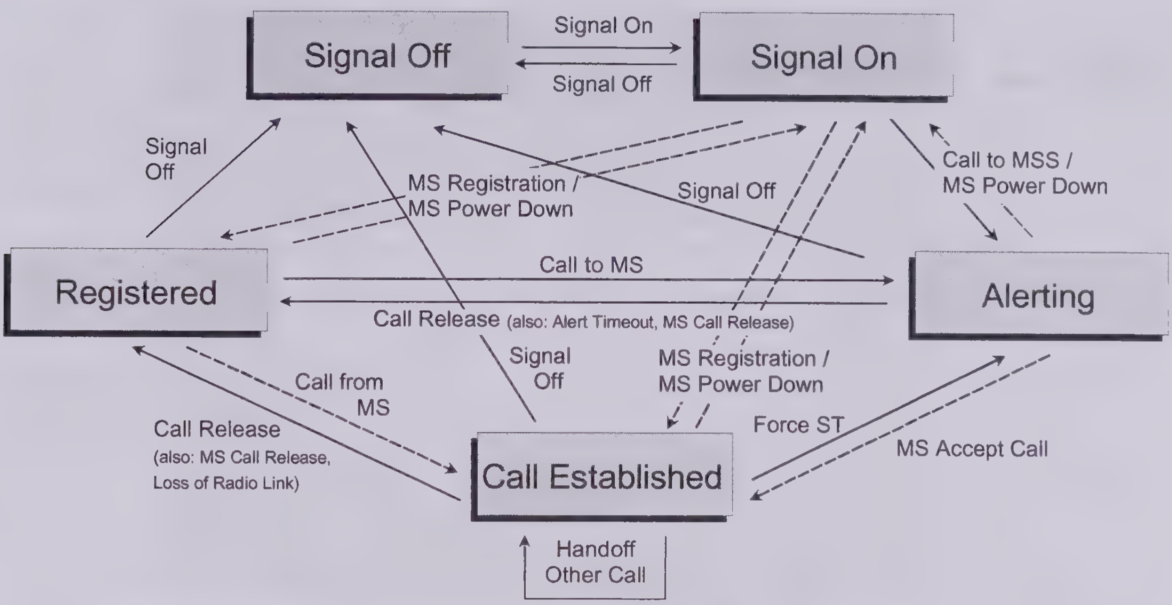

Signal Off
Signal On
Signal On
Signal Off
Registered
Alerting
Call Established
Signal Off
MS Registration / MS Power Down
Signal Off
Call to MSS / MS Power Down
Call to MS
Call Release (also: Alert Timeout, MS Call Release)
Signal Off
MS Registration / MS Power Down
Call from MS
Call Release (also: MS Call Release, Loss of Radio Link)
Force ST
MS Accept Call
Handoff Other Call

Fig. 4-27 Signalling states of the CMU

Corresponding to the five possible signalling states, five different *Signalling* menus are available. When a signalling state is reached, the corresponding menu is opened automatically (exception: see softkey *Open Pop. autom.*).

Note: *For a complete overview of signalling states including the Handoff process see Fig. 6.1 in chapter 6 of this manual.*

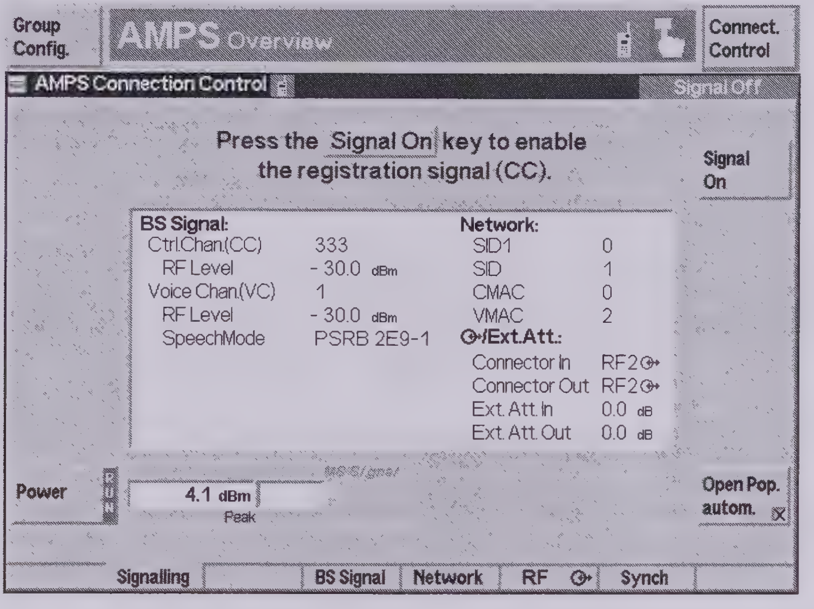
Signalling Control without Signal (State Signal Off)

The popup menu *Signalling (Signal Off)* provides information on:

- The most important parameters concerning the frequency and level of the signal transmitted by the CMU in the state *Signal On (BS Signal)*,
- The *Network* parameters,
- Selected RF connectors and external attenuation *(RF ⊖)*,
- Status and result of the wide-band peak-power measurement *(Power)*.
- Besides, it activates the control channel signal for the call setup to the mobile station *(Signal On)*.

The popup menu *Signalling (Signal Off)* is opened when the function group *AMPS MS Signalling* is selected, or if the registration signal (control channel, CC) is switched off *(Signal Off* softkey*)* while the system is in another signalling state. It is replaced by the *Signalling (Signal On)* menu after the CC signal on the CMU is switched on (Softkey *Signal On,* see Fig. 4-27).

Connect. Control →



Press the Signal On key to enable the registration signal (CC).

BS Signal:		Network:	
Ctrl.Chan.(CC)	333	SID1	0
RF Level	- 30.0 dBm	SID	1
Voice Chan.(VC)	1	CMAC	0
RF Level	- 30.0 dBm	VMAC	2
SpeechMode	PSRB 2E9-1	⊕/Ext.Att.:	
		Connector In	RF2⊕
		Connector Out	RF2⊕
		Ext. Att. In	0.0 dB
		Ext. Att. Out	0.0 dB

Power 4.1 dBm Peak

Fig. 4-28 Connection Control – Signalling (Signal Off)

BS Signal The table *BS Signal* indicates the most important parameters concerning the frequency and level of the control and voice channel signals transmitted by the CMU in the state *Signal On*. These parameters are set in the tab *BS Signal* and explained in more detail there (see section *Signals of the CMU (Connection Control – BS Signal)* on page 4.72).

Remote control `CONFigure:BSSignal...`

Network The table *Network* indicates the 14-bit *(SID 1)* and the 15-bit System Identity *(SID)*. The *SID 1* is a unique number identifying the cellular system (network). The *SID* consists of the *SID 1* plus one bit identifying the control channel (CC) system A or B (see Table 4-1 on page 4.40 and Table 4-2 on page 4.42). The *SID 1* is set in the *Network* tab (see section *Network Parameters (Connection Control – Network)* on page 4.74); the SID is calculated from the SID 1 and the channel information.

Below the SID, the voice channel *(VMAC)* and control channel mobile attenuation code *(CMAC)* is displayed. The MAC levels are set in the *Network* tab, see p. 4.74 ff.

Remote control `CONFigure:NETWork...`

AF/RF ⊕ The table *AF/RF* ⊕ indicates the RF connectors and external attenuations. These parameters are set in the tab *AF/RF* ⊕ and are explained in more detail there (see section *RF Connectors (Connection Control – RF/AF Connector)* on page 4.38).

Remote control `[SENSe:]CORRection:LOSS...?`

Power The *Power* softkey controls the wide-band power measurement and indicates its state *(RUN | HLT | OFF)*.

In the associated fields, the peak power of the received signal is indicated as absolute numerical value and relative to the effective radiated power (ERP) of the mobile (analog bar). The analog bar views the RF input power range between *ERP – 10 dB* and *ERP + 10 dB*. The ERP depends on the VMAC set in the *Overview* menu and on the power class of the mobile; see Table 4-3 on page 4.57.

Remote control `INITiate:WPOWer`

```
FETCh:WPOWer:STATus?
READ[:SCALar]:WPOWer[:RESult]?
FETCh[:SCALar]:WPOWer[:RESult]?
SAMPle[:SCALar]:WPOWer[:RESult]?
```

Signal On

The *Signal On* softkey switches on a control channel signal (*CC*) to which the mobile station can synchronize.

By switching on the signal, the CMU changes to the signalling state *Signal On*. A user prompt below the menu header indicates the function of this softkey.

Remote control `PROCedure:Signalling:ACTion SON`

Open Pop. autom. ☐

The *Open Pop. autom.* softkey contains a field which activates or suppresses display of the popup menu *Signalling (Signal Off)*.

- In the default setting (*Open Pop. autom.* on), the popup menu is displayed each time the *Signal Off* state is reached (due to a change of the signalling state or function group).
- In the alternative setting (*Open Pop. autom.* off), the popup-menu is suppressed. Signalling may still be controlled, e.g., via the mobile. Moreover, the popup menu *Signalling (Signal Off)* can also be opened explicitly by pressing the corresponding hotkey in the menu group *Connection Control*.

Remote control –

Signalling Control with Signal (State Signal On)

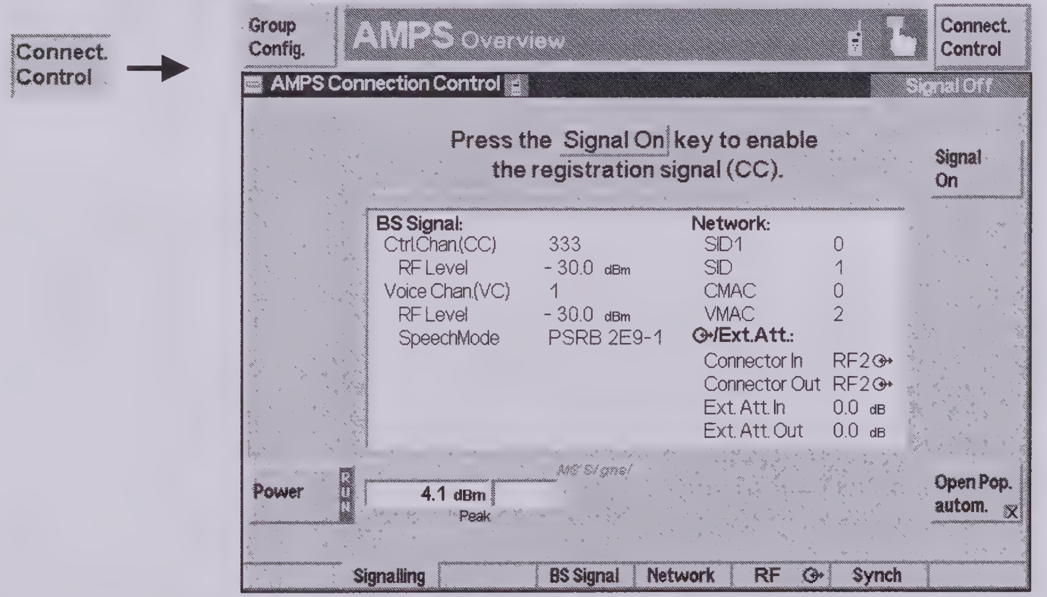
The popup menu *Signalling (Signal On)* provides information on

- The signals transmitted by the CMU *(BS Signal)*
- The network parameters *(Network)*
- The AF/RF connectors *(AF/RF ⊕)*
- The status and result of the peak power measurement *(Power)*

Besides, it contains softkeys which lead to other signalling states:

- Deactivating the control channel signal for establishing the first connection to the mobile station *(Signal Off)*
- Setting up a call to the mobile station (*Call to MS* state *Alerting)*

The popup menu *Signalling (Signal On)* is opened after the *CC* signal on the CMU is switched on (Softkey *Signal On* in the popup menu *Signalling (Signal Off)*). It is replaced by the *Signalling (Registered)* menu after the mobile station initializes a registration by itself. It is replaced by the *Signalling (Call Established)* menu if the mobile station sets up a call to the CMU. It is replaced by the *Signalling (Alerting)* menu if a mobile is called via the *Call to MS* softkey (see Fig. 4-27).



Press the Signal On key to enable the registration signal (CC).

BS Signal:
Ctrl.Chan.(CC) 333
RF Level - 30.0 dBm
Voice Chan.(VC) 1
RF Level - 30.0 dBm
SpeechMode PSRB 2E9-1

Network:
SID1 0
SID 1
CMAC 0
VMAC 2

⊕/Ext.Att.:
Connector In RF2⊕
Connector Out RF2⊕
Ext. Att. In 0.0 dB
Ext. Att. Out 0.0 dB

MS Signal
4.1 dBm
Peak

Fig. 4-29 Connection Control – Signalling (Signal On)

The meaning of the displays under *BS Signal, Network* and *AF/RF ⊕* as well as of the *Power* softkey is described in section *Signalling Control without Signal (State Signal Off)* on page 4.51.

Signal Off	The *Signal Off* softkey switches off the CMU's control channel signal to which the mobile station can synchronize. The CMU changes to the signalling state *Signal Off.*
Remote control	`PROCedure:Signalling:ACTion SOFF`

Call to MS

The *Call to MS* softkey sets up a call to the mobile station.

A user prompt below the header indicates that the mobile station must synchronize to the CMU signal first. After successful synchronization, the message *Paging in progress ...* is displayed below the header; the CMU changes to the signalling state *Alerting*. As soon as the mobile is picked up the CMU changes to the signalling state *Call Established*.

Note: *To set up a call, the CMU transmits fife page messages at maximum. If the* Call to MS *procedure still fails (e.g. because the mobile was not properly connected), the message* Call to mobile was not successful ! *is displayed in a message window. The message window is closed after a while or after it is confirmed by pressing the* ENTER *key.*

Remote control `PROCedure:Signalling:ACTion CTM`

Open Pop. autom. ☐

The softkey *Open Pop. autom.* contains a field which activates or suppresses the display of the popup menu *Signalling (Signal On)*.

- In the default setting (*Open Pop. autom.* on), the popup menu is displayed each time the *Signal On* state is reached (due to a change of the signalling state or function group).
- In the alternative setting (*Open Pop. autom.* off), the popup-menu is suppressed. Signalling may still be controlled, e.g., via the mobile. Moreover, the popup menu *Signalling (Signal On)* can also be opened explicitly by pressing the corresponding hotkey in the menu group *Connection Control*.

Overview of the Function Group

The main menu *Overview* gives an overview of the function group *AMPS-MS Signalling* including the most important settings and measurement results.

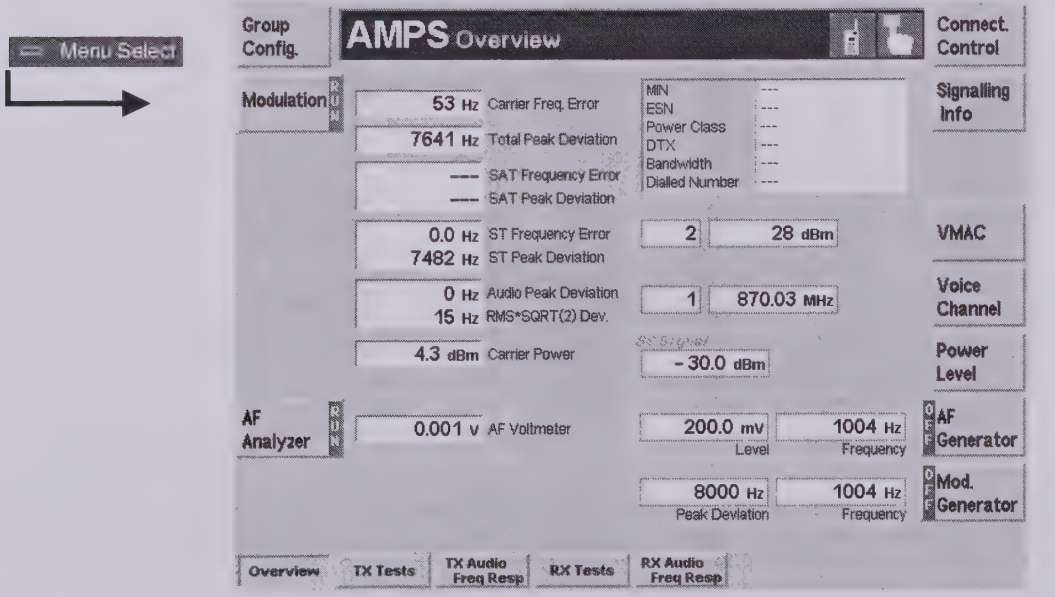
The panels on the left side report the following basic measurement results:

- The main softkey *Modulation* in the upper part controls the *TX Tests* and informs on their current status (*RUN | HALT | OFF).* The displayed measurement results of the *Modulation* application are discussed under the measurement menu *TX Tests* on page 4.8 ff.
- The main softkey *AF Analyzer* controls the audio analyzer and informs on its current status (*RUN | HALT | OFF).* The RMS voltage of the AF signal fed in via *AF IN* is displayed.

The panels on the right side display signalling information and provide settings concerning the mobile station and the signals transmitted by the CMU:

Panel *Signalling Info*	Parameters of the mobile station	See page 4.63 ff.
Panel *VMAC*	Voice channel settings	See below
Panel *BS Signal*	BS signal settings	See page 4.72
Softkey *AF Generator*	Configuration of the audio generator	See page 4.2
Softkey *Mod. Generator*	Configuration of the modulation generator	See page 4.2

The main menu *Overview* is opened from the main menu *Menu Select* (with associated key at the front of the instrument) and after closing the configuration menu *Connection Control - Signalling* (using the *Escape* key or automatically after establishing a call connection). From the *Overview* menu, the remaining measurement menus of the function group *(TX Tests, TX Audio Freq. Response, RX Tests,* and *RX Audio Freq. Response)* can be accessed via hotkeys.



53 Hz Carrier Freq. Error
7641 Hz Total Peak Deviation
--- SAT Frequency Error
--- SAT Peak Deviation
0.0 Hz ST Frequency Error
7482 Hz ST Peak Deviation
0 Hz Audio Peak Deviation
15 Hz RMS*SQRT(2) Dev.
4.3 dBm Carrier Power
0.001 V AF Voltmeter

MIN ---
ESN ---
Power Class ---
DTX ---
Bandwidth ---
Dialled Number ---

2 28 dBm
1 870.03 MHz
BS Signal -30.0 dBm
200.0 mV Level 1004 Hz Frequency
8000 Hz Peak Deviation 1004 Hz Frequency

Fig. 4-30 Function overview – main menu Overview

VMAC

The *VMAC* softkey sets the voice mobile attenuation code.

The VMAC can be entered either as a dimensionless number or a maximum output power in dBm. The 8 voice mobile attenuation codes and four power classes defined for AMPS mobile phones are shown in Table 4-3 below along with the corresponding effective radiated power (ERP) ranges.

Remote control `PROCedure:Signalling[:AVC]:MAC 0 ... 7` (Call Established)

Table 4-3 AMPS power classes and voice mobile attenuation codes (VMAC)

VMAC (CMAC)	ERP in dBm				Tolerance in dB
	Class I	Class II	Class III	Class IV	
0	36	32	28	28	+2 / –4
1	32	32	28	28	+2 / –4
2	28	28	28	28	+2 / –4
3	24	24	24	24	+2 / –4
4	20	20	20	20	+2 / –4
5	16	16	16	16	+2 / –4
6	12	12	12	12	+2 / –4
7	8	8	8	8	+2 / –4

Voice Channel

The *Voice Channel* softkey defines the channel number and frequency of the generated voice signal.

For an overview of the AMPS channel assignment in the reverse path (from mobile to base station/CMU) see Table 4-1 on page 4.40.

Remote control

```
CONFigure:BSSignal[:AVC]:CHANnel  <Number>
PROCedure:SIGNalling[:AVC]:CHANnel  <Number>
```

Important note: current vs. default values

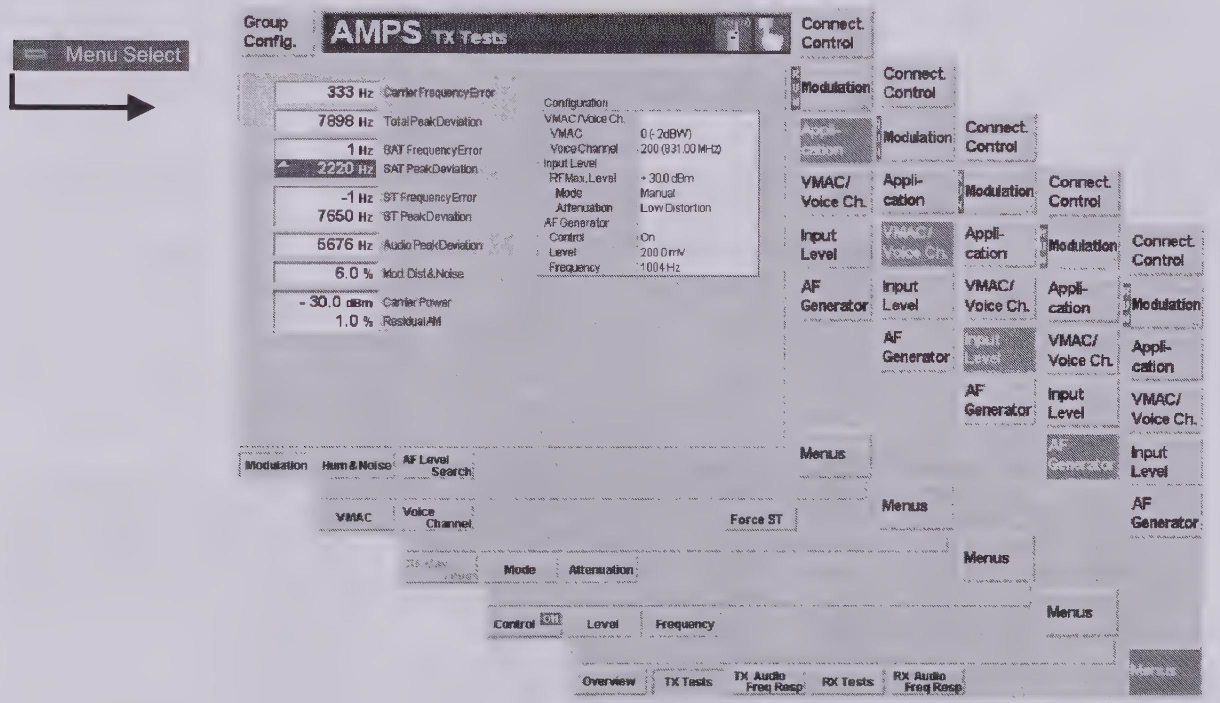
Some parameters of the CMU assume two independent values: The default value *is used to set up a call; it can be modified in the signalling states* Signal Off, Signal On *and* Registered. *The* current value *during the call (signalling state* Call Established) *can still be changed, however, modifying this current value does not alter the default value. An example of such a double parameter in AMPS-MS is the BS Signal* Power Level.

In remote control, default values are set with a `CONFigure ...` *command, current values are set with the corresponding* `PROCedure ...` *command.*

TX Tests

The menu group *TX Tests* comprises the measurement of parameters characterizing the transmitter quality of the mobile phone. The measurement results are displayed in the measurement menu *TX Tests,* the popup menu *TX Tests Configuration* is used for configuration of the measurements.

Most settings and functions of this menu do not depend on the signalling state and correspond to those of the menu *TX Tests* in the operating mode *AMPS-MS Non Signalling* (for a detailed description see p. 4.4 ff.). The additional features in *Signalling* mode are related to the voice mobile attenuation code *(VMAC,* see Table 4-3 on page 4.57) which is set via the *VMAC/Voice Ch.* softkey and can be used to determine the maximum input level the CMU is able to measure:



333 Hz Carrier Frequency Error
7898 Hz Total Peak Deviation
1 Hz SAT Frequency Error
2220 Hz SAT Peak Deviation
-1 Hz ST Frequency Error
7650 Hz ST Peak Deviation
5676 Hz Audio Peak Deviation
6.0 % Mod Dist & Noise
- 30.0 dBm Carrier Power
1.0 % Residual AM

Configuration
VMAC/Voice Ch.
VMAC 0 (-2dBW)
Voice Channel 200 (831.00 MHz)
Input Level
RF Max. Level +30.0 dBm
Mode Manual
Attenuation Low Distortion
AF Generator
Control On
Level 200.0 mV
Frequency 1004 Hz

Fig. 4-31 Measurement menu TX Tests

VMAC / Voice Ch.	The *VMAC / Voice Ch.* softkey configures the RF analyzer and sets the VMAC of the mobile phone.
VMAC	The *VMAC* hotkey sets the voice mobile attenuation code. Together with the MS power class the VMAC determines the effective radiated power of the mobile. It is also indicated in the *Overview* menu (see p. 4.56).
Remote control	`PROCedure:Signalling[:AVC]:MAC 0 ... 7`
Voice Channel	The *Voice Channel* hotkey defines the channel number of the RF voice signal transmitted by the mobile phone. See section *Control of Input and Output Signals (Connection Control – Signal)* Panel *Analyzer Settings* on page 4.38.
Remote control	`PROCedure:Signalling[:AVC]:CHANnel <Channel>`

Frequency

The *Frequency* hotkey defines the signal frequency in MHz of the RF voice signal to be analyzed. See section *Control of Input and Output Signals (Connection Control – Signal)*, Panel *Analyzer Settings* on page 4.38.

Remote control

```
UNIT:CHANnel Hz
PROCedure:Signalling[:AVC]:CHANnel <Frequency>
```

Force ST

The *Force ST* hotkey forces the connected mobile to switch from the *Call Established* state back to the *Alerting* state where it transmits a ST tone.

Force ST is available in the *Call Established* signalling state and is to provide a short cut to the *ST Frequency Error* and *ST Peak Deviation* measurements. These quantities can not be determined during a call where the AMPS mobile doesn't transmit the ST (see section *SAT and ST* on p. 4.42 ff). To return to *Call Established* after the measurement of the ST parameters it is sufficient to pick up the mobile and accept the attempted call.

Remote control

```
PROCedure:SIGNalling:ACTion FST
```

Input Level

The *Input Level* softkey configures the RF input level. See also section Input Level (Group Configuration – Input Level) on page 4.78.

Max. Level

The *Max. Level* hotkey determines the maximum expected input level in dBm.

Remote control

```
[SENSE:]LEVel:MAXimum  <Level>
```

Mode

The *Mode* hotkey determines how the maximum input level is defined.

Manual	Manual input of reference level
VMAC	Automatic setting according to the digital mobile attenuation code of the mobile phone. The VMAC is set in the *Overview* menu or using the softkey *VMAC / Voice Chan.* (see above).

Remote control

```
[SENSE:]LEVel:MODE  MANual | VMAC
```

Attenuation

The *Attenuation* hotkey defines an (internal) attenuation factor for the input signal.

Normal	Input signal is kept unchanged
Low Noise	Enhanced mixer level, full dynamic range
Low Distortion	Decreased mixer level, high transmission reserve

Remote control

```
[SENSE:]LEVel:ATTenuation  NORMal | LNOIse | LDIStortion
```

For all other settings, measurement results and the configuration menu please refer to section *TX Tests* on page 4.4 ff.

TX Audio Freq. Response

The menu group *TX Audio Freq. Response* provides the measurement of the electrical audio response of the mobile phone transmitter. The measurement results are displayed in the graphical measurement menu *TX Audio Freq. Response,* the popup menu *TX Audio Freq. Response Configuration* is used for configuration of the measurements.

Most settings and functions of this menu do not depend on the signalling state and correspond to those of the menu *TX Audio Freq. Response* in the operating mode *AMPS-MS Non Signalling* (for a detailed description see p. 4.16 ff). The differences to the *Non Signalling* mode are related to the voice mobile attenuation code *(VMAC*, see Table 4-3 on page 4.57) which is set via the *VMAC/Voice Ch.* softkey and can be used to determine the maximum input level the CMU is able to measure. This is analogous to the TX Tests menu described above (see p. 4.58 ff).

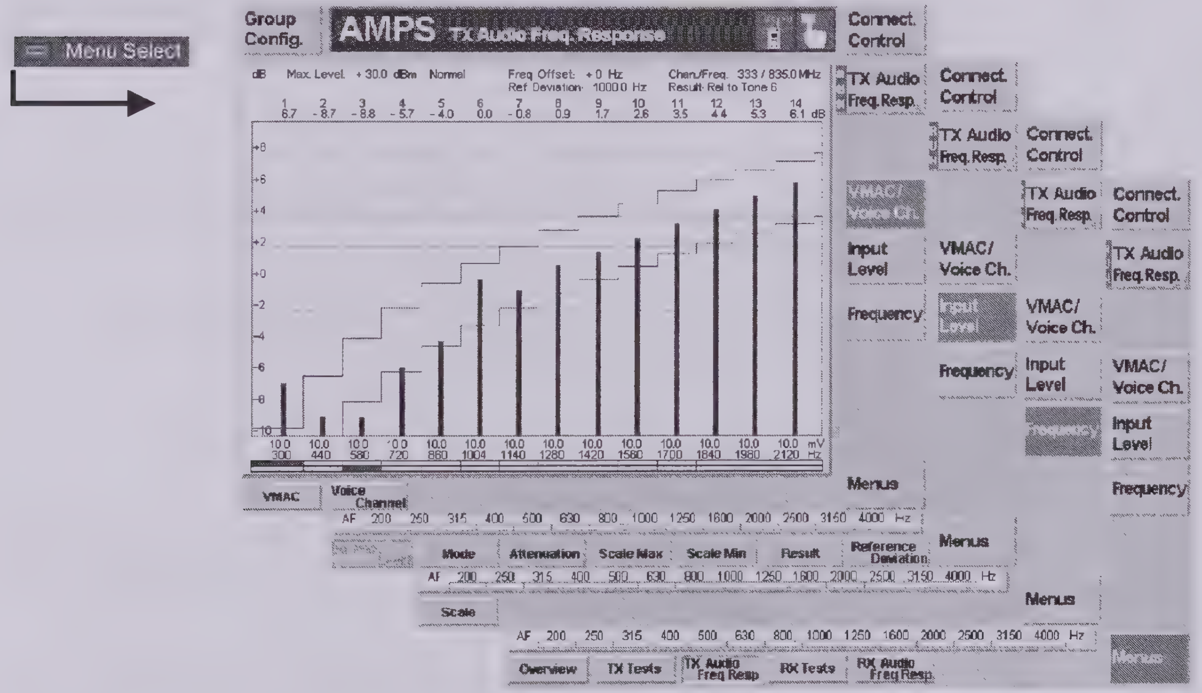
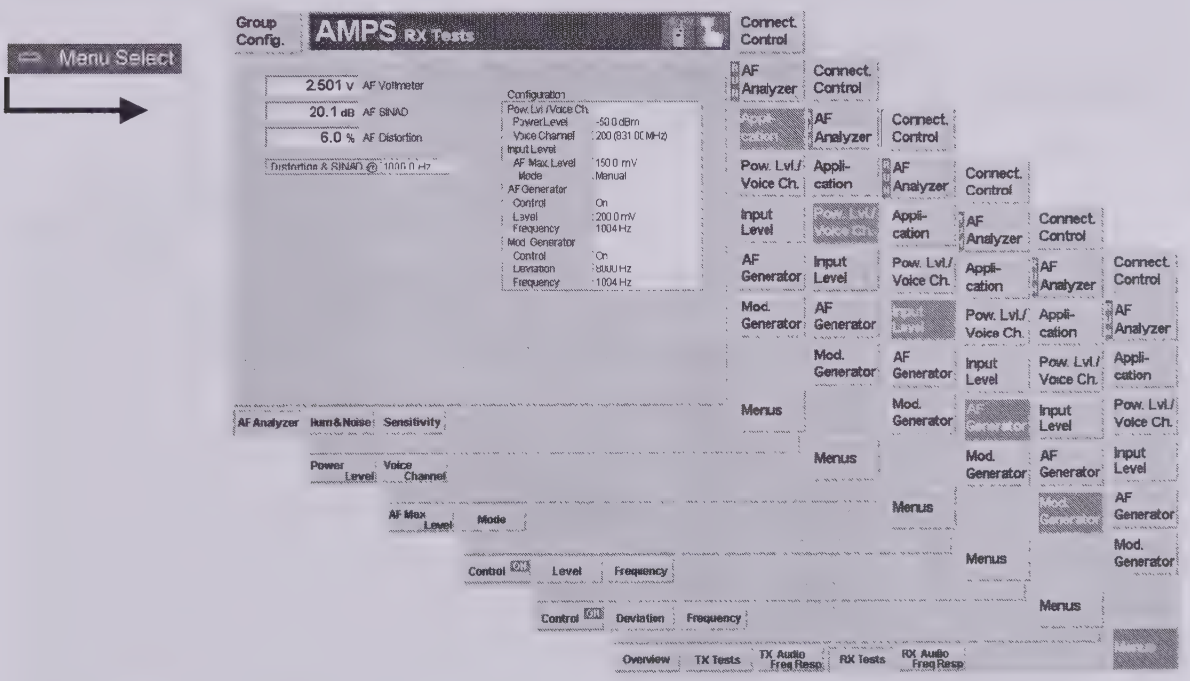


Fig. 4-32 Measurement menu TX Audio Freq. Response

RX Tests

The menu group *RX Tests* comprises the measurement of parameters characterizing the receiver quality of the mobile phone. The measurement results are displayed in the measurement menu *RX Tests,* the popup menu *RX Tests Configuration* is used for configuration of the measurements.

Most settings and functions of this menu do not depend on the signalling state and correspond to those of the menu *RX Tests* in the operating mode *AMPS-MS Non Signalling* (for a detailed description see p. 4.24 ff). The differences to the *Non Signalling* mode are related to the voice mobile attenuation code *(VMAC*, see Table 4-3 on page 4.57) which is set via the *VMAC/Voice Ch*. softkey and can be used to determine the maximum input level the CMU is able to measure. This is analogous to the TX Tests menu described above (see p. 4.58 ff).



2.501 V AF Voltmeter
20.1 dB AF SINAD
6.0 % AF Distortion
Distortion & SINAD @ 1000.0 Hz

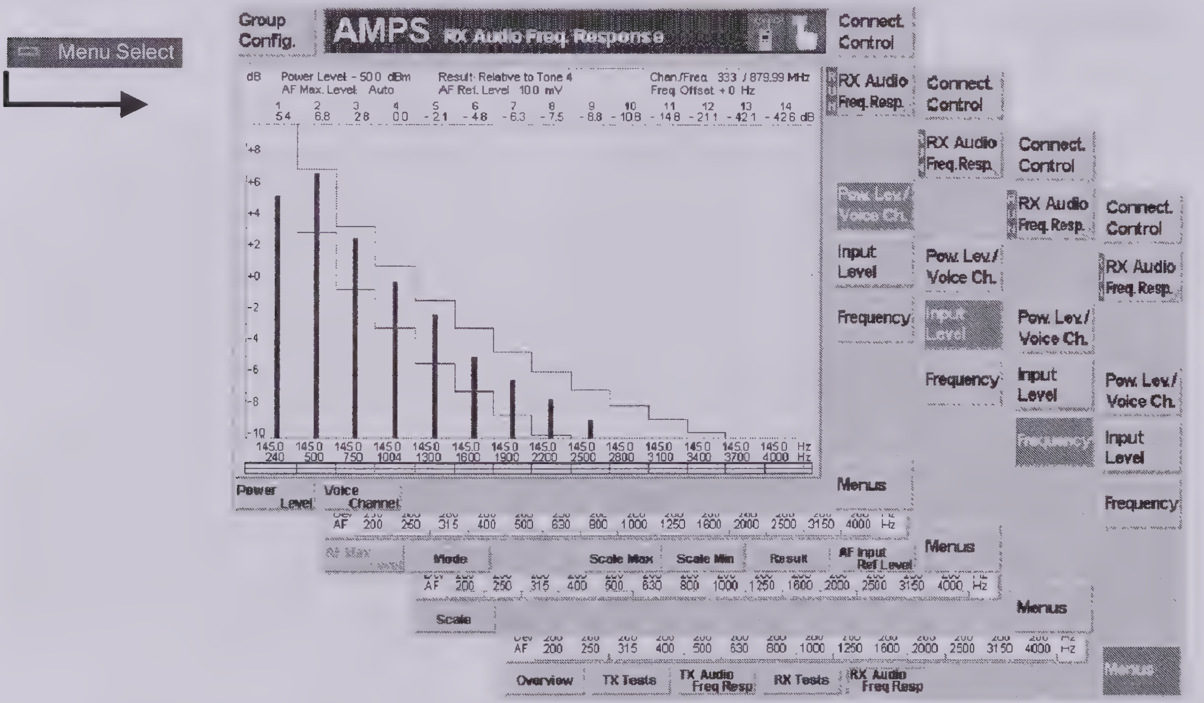
Configuration
Pow. Lvl /Voice Ch.
Power Level -50.0 dBm
Voice Channel 200 (831.00 MHz)
Input Level
AF Max. Level 150.0 mV
Mode Manual
AF Generator
Control On
Level 200.0 mV
Frequency 1004 Hz
Mod. Generator
Control On
Deviation 8000 Hz
Frequency 1004 Hz

Fig. 4-33 Measurement menu RX Tests

RX Audio Freq. Response

The menu group *RX Audio Freq. Response* provides the measurement of the electrical audio frequency response of the mobile phone receiver. The measurement results are displayed in the graphical measurement menu *RX Audio Freq. Response,* the popup menu *RX Audio Freq. Response Configuration* is used for configuration of the measurements.

Most settings and functions of this menu do not depend on the signalling state and correspond to those of the menu *RX Audio Freq. Response* in the operating mode *AMPS-MS Non Signalling* (for a detailed description see p. 4.33 ff). The differences to the *Non Signalling* mode are related to the voice mobile attenuation code *(VMAC*, see Table 4-3 on page 4.57) which is set via the *VMAC/Voice Ch.* softkey and can be used to determine the maximum input level the CMU is able to measure. This is analogous to the TX Tests menu described above (see p. 4.58 ff).



Power Level - 50.0 dBm
AF Max. Level: Auto
Result: Relative to Tone 4
AF Ref. Level 10.0 mV
Chan./Freq. 333 / 879.99 MHz
Freq. Offset +0 Hz

Fig. 4-34 Measurement menu RX Audio Freq. Response

Connection Control (Contd.)

The menu group *Connection Control* controls the signalling procedures (call setup and release, signalling parameters) and determines the inputs and outputs with the external attenuation values and the reference frequency.

As *Signalling* measurements are typically performed with a call connection to the mobile station, the first two tabs for setting up the call (*Connection Control – Signalling)* appear immediately after selection of the function group *AMPS-MS Signalling* in the *Menu Select* menu. Alternatively, the *Connection Control* menu can be called up by pressing the softkey *Connect. Control* at the top right in every measurement menu; the individual tabs can be accessed via the hotkey bar at the lower edge of the screen. By pressing the *Escape* key, the *Connection Control* menu is closed and the CMU changes to the measurement mode.

The two tabs *Connection Control – Signalling* displayed immediately after the function group *AMPS-MS Signalling* is activated are described at the beginning of section *AMPS Mobile Tests (Signalling Mode)* on p. 4.50 ff. The remaining tabs of the *Connection Control - Signalling* menu are described below.

Signalling Control in the Registered State

The popup menu *Signalling (Registered)* provides information on

- the current data of the mobile station *(Mobile registered)*,
- the status and result of the peak power measurement *(Power)*.

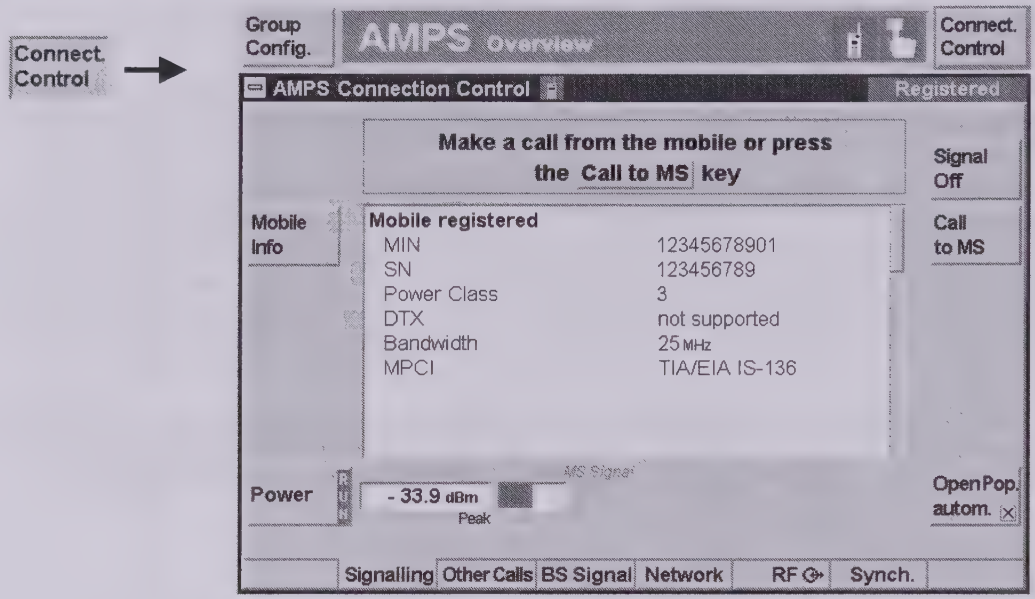
Besides, it contains softkeys which lead to other signalling states:

- Deactivation of the control channel signal for synchronization and call release to the mobile station *(Signal Off)*,
- Establishing a call to the mobile station (*Call to MS* –> state *Call Established),*

The popup menu *Signalling (Registered)* is opened when a successful call (in which case the mobile is considered as being registered) is released *(Call Release* softkey in the *Alerting* or in the *Call Established* state, MS call release, loss of radio link) or when registration is initiated by the mobile phone. It is replaced by the *Signalling (Alerting)* menu if the CMU initiates a call to the mobile phone (Softkey *Call to MS),* or by the *Signalling (Call Established)* menu if the mobile phone initiates a call to the CMU, see Fig. 4-27.

Note: *If the synchronization is lost during operation (because of a low signal level etc.) the warning* Loss of radio link ! *will appear.*

At the same time, bit 2 is set in the STATus:OPERation register. The message window is closed after a while or after it is confirmed by pressing the ENTER *key.*



Make a call from the mobile or press the Call to MS key

Mobile registered

MIN	12345678901
SN	123456789
Power Class	3
DTX	not supported
Bandwidth	25 MHz
MPCI	TIA/EIA IS-136

- 33.9 dBm Peak

Fig. 4-35 Connection Control – Signalling (Registered)

The function of the *Power* softkey is described in the section *Signalling Control without Signal (State Signal Off)* on page 4.51, the softkey *Signal Off* in the section *Signalling Control with Signal (State Signal On)* on page 4.54.

Mobile Info The table *Mobile Info* indicates the mobile parameters transferred to the CMU in the registration. A selection of the signalling parameters appears also when the call has been established (see section *Signalling Control with Call Established* on page 4.66).

MIN	Mobile identification number (typically equal to the customer's telephone number). Together with the serial number, the MIN is used to identify the phone and its status.
SN	32-bit (electronical) serial number (only if requested, see *Connection Control – Network* menu on page 4.74 ff.).
Power Class	Power class of the mobile, see Table 4-3 on page 4.57.
DTX	Discontinuous transmission mode, see section *Network Parameters (Connection Control – Network)* on page 4.74 ff.
Bandwidth	Width of the whole RF band (20 MHz or 25 MHz).
MPCI	Mobile Protocol Capability Indicator, 2-bit field indicating the mobile station's capabilities: 00 indicates TIA/EIA-553 or IS-54A mobile station 01 indicates TIA/EIA-627 dual-mode mobile station 10 reserved (see TIA/EIA IS-95) 11 indicates TIA/EIA-136 dual-mode mobile station

Remote control `[SENSe:]MSSinfo:...?`

Call to MS

The softkey *Call to MS* sets up a call to the mobile station.

A user prompt below the header indicates the function of this softkey. On pressing it the message *Paging in progress ...* is displayed below the header. *The CMU changes to the signalling state Alerting.* As soon as the mobile is picked up the CMU changes to the signalling state *Call Established*.

Remote control `PROCedure:Signalling:ACTion CTM`

Open Pop. autom. ☐

The softkey *Open Pop. autom.* contains a field which activates or suppresses the display of the popup menu *Signalling (Registered)*.

- In the default setting (*Open Pop. autom.* on), the popup menu is displayed each time the *Registered* state is reached (due to a change of the signalling state or function group).
- In the alternative setting (*Open Pop. autom.* off), the popup-menu is suppressed. Signalling may still be controlled, e.g., via the mobile. Moreover, the popup menu *Signalling (Registered)* can also be opened explicitly by pressing the corresponding hotkey in the menu group *Connection Control*.

Remote control –

Signalling Control in the Alerting State

The popup menu *Signalling (Alerting)* provides information on

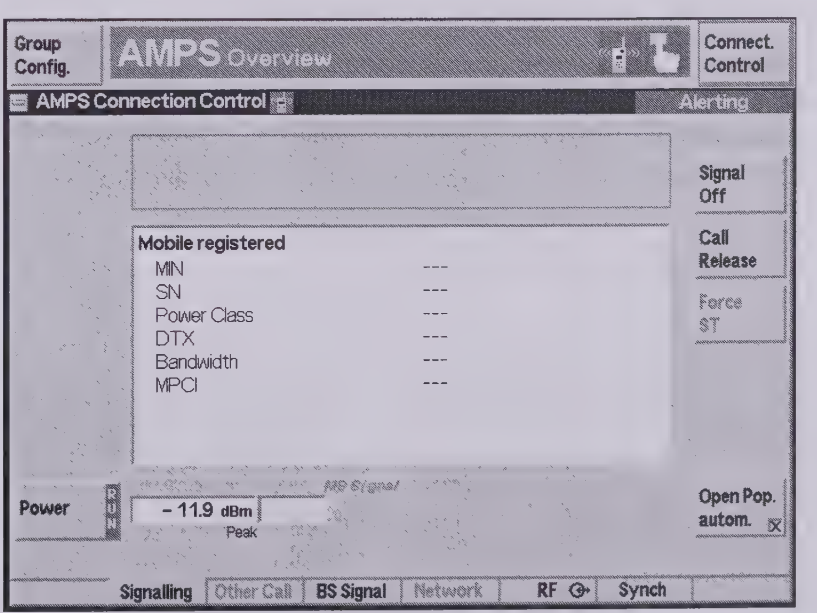
- The characteristics of the registered mobile station *(Mobile registered)*
- The status and result of the peak power measurement *(Power)*

Besides, it contains softkeys which lead to other signalling states:

- Deactivation of the control channel signal for synchronization and call release *(Signal Off)*
- *Call Release* while keeping the control channel signal switched on (state *Registered)*

The popup menu *Signalling (Alerting)* is opened while the mobile phone is ringing during a call setup *(Call to MS* softkey in the *Signal On* or in the *Registered* state). It is replaced by the *Signalling (Call Established)* menu when the mobile phone accepts the call (is picked up), or by the *Signalling (Registered)* menu if the call is released *(Call Release* softkey, MS call release, alert timeout after 5 page messages, loss of radio link), see Fig. 4-27.

Connect. Control →



Mobile registered
MIN ---
SN ---
Power Class ---
DTX ---
Bandwidth ---
MPCI ---

Power – 11.9 dBm Peak

Fig. 4-36 Connection Control – Signalling (Alerting)

The function of the *Power* softkey is described in the section *Signalling Control without Signal (State Signal Off)* on page 4.51, the softkey *Signal Off* in the section *Signalling Control with Signal (State Signal On)* on page 4.54.

Mobile Info The table *Mobile Info* indicates the characteristics of the called mobile station. All parameters are already displayed in the *Registered* state and described on page 4.63 ff.

Remote control `[SENSe:]MSSinfo:...?`

Call Release The *Call Release* softkey releases the call to the mobile station.

The CMU changes to the signalling state *Registered*.

Remote control `PROCedure:Signalling:ACTion CRELease`

Close Pop. autom. ☐ The softkey *Close Pop. autom.* contains a button which can be used to close the menu *Signalling (Alerting)* automatically when a call is set up.

- In the default setting (*Close Pop. autom.* on), the popup menu is closed as soon as the Signalling state *Alerting* is reached or a handoff is performed.
- In the alternative setting (*Close Pop. autom.* off), the popup-menu must be closed explicitly (e.g. via the *Escape* key) to continue the measurement.

Remote control –

Signalling Control with Call Established (Signalling State Call Established)

The popup menu *Signalling (Call Established)* provides information on

- A selection of signalling parameters of the mobile station *(Mobile Info)*
- The status and result of the peak power measurement *(Power)*

It contains softkeys which lead to other signalling states (see Fig. 4-27):

- Deactivation of the signal for synchronization and release of the call to the mobile station *(Signal Off)*
- Release of the call to the mobile station (*Call Release* state *Registered)*
- Call release and return to the *Alerting* state (*Force ST* state *Alerting)*

It permits the following network and signal parameters to be entered:

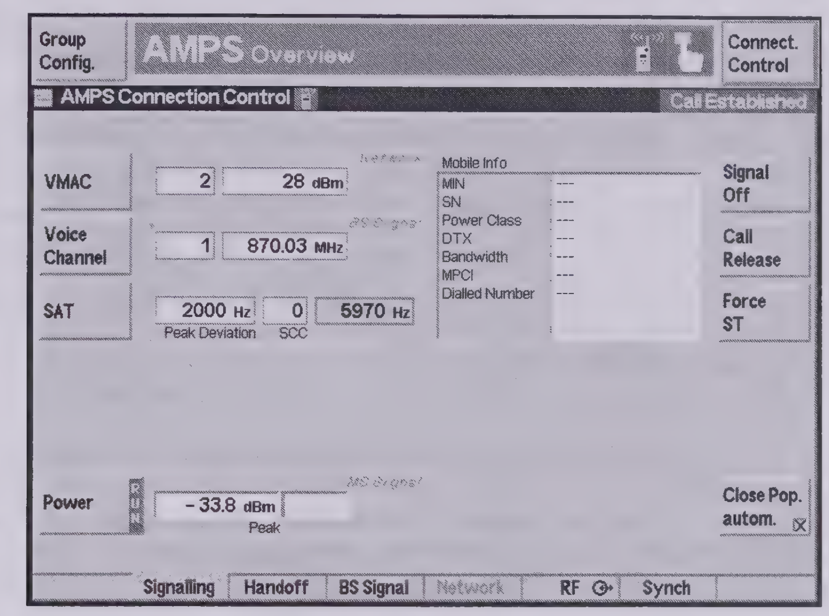
- Voice mobile attenuation code *(VMAC)*
- Number and frequency of the voice channel *(Voice Channel)*
- Frequency and peak deviation of the supervisory audio tone *(SAT)*

The popup menu *Signalling (Call Established)* is opened when a call is initiated by a mobile station which is already registered *(Signal On* or *Registered* state), or after a call initiated by the CMU is accepted by the mobile station. It is replaced by the *Signalling (Signal Off)* menu after the CC signal is switched off *(Signal Off* softkey), or by the *Signalling (Registered)* menu if the call is released *(Call Release* softkey, MS call release, loss of radio link), see Fig. 4-27. Besides, the *Force ST* hotkey provides a short cut back to the *Alerting* state.

Note: *If the synchronization is lost during operation (because of a low signal level etc.) the warning* Loss of radio link ! *will appear.*

At the same time, bit 2 is set in the STATus:OPERation register. Prior to further operation, confirm the reception of the message by pressing the ENTER *key.*

Connect. Control →



VMAC: 2 | 28 dBm

Voice Channel: 1 | 870.03 MHz

SAT: 2000 Hz Peak Deviation | 0 SCC | 5970 Hz

Power: - 33.8 dBm Peak

Mobile Info
MIN : ---
SN : ---
Power Class : ---
DTX : ---
Bandwidth : ---
MPCI : ---
Dialled Number : ---

Fig. 4-37 Connection Control – Signalling (Call Established)

The function of the softkeys *Signal Off* and *Power* is described in the section *Signalling Control without Signal* on page 4.51. The softkeys *Call Release* and *Close Pop. autom.* are described in the previous section, *Signalling Control in the Alerting State*. For a description of the *VMAC* softkey refer to section *Overview of the Function Group* on page 4.56.

The panel *BS Signal* combines two softkeys which are used for configuration of the signals generated by the CMU.

Voice Channel

The *Voice Channel* softkey determines the number of the *voice* channel.

The parameters for the voice channel are described in detail in section *Signal Parameters (States Signal Off/On, Registered)* on page 4.72 ff. For an overview of *AMPS* channels see section *Control of Input and Output Signals* on page 4.38.

Remote control `CONFigure:BSSignal[:AVC]:CHANnel  <Channel>`

SAT

The *SAT* softkey configures the supervisory audio tone provided by the CMU and transmitted over the voice channel.

In the network, the supervisory audio tone (SAT) is transmitted over the forward voice channel (CMU/base station to mobile) and retransmitted by the mobile back to the base station. Its purpose is to indicate the continuity of a call and to identify the base station with which the mobile station is communicating. To distinguish different base stations, three different SAT color codes *(SCC)* corresponding to three SAT frequencies f_{SAT} are defined in AMPS:

SCC = 0	f_{SAT} = 5970 Hz
SCC = 1	f_{SAT} = 6000 Hz
SCC = 2	f_{SAT} = 6030 Hz

The SAT must be switched on to perform several of the tests specified in the standard.

Peak Deviation The *Peak Deviation* input field defines the maximum frequency deviation that the CMU uses to transmit the SAT to the mobile phone. The *SAT Peak Deviation* in the reverse path (mobile phone to base station) can be measured in the *TX Tests* measurement menu, see p. 4.5 ff.

SCC

The *SCC* input field defines the SAT color code. The frequency corresponding to the SCC selected is indicated to the right of the *SCC* input field.

Remote control

```
CONFigure:BSSignal:SAT:PEAKdev <Deviation>
CONFigure:BSSignal:SAT:SCC <Code>
```

Mobile Info

The table *Mobile Info* indicates the characteristics of the connected mobile station:

Dialed number Number dialed at the mobile station (Call from MS)

The remaining parameters are already displayed in the *Registered* state and described on page 4.63 ff.

Remote control

```
[SENSe:]MSSinfo...?
```

Force ST

The *Force ST* softkey releases the call and forces the mobile back to the *Alerting* state.

This function is particularly suitable for *TX Tests*, application *Modulation*. In this application, parameters involving the Signalling Tone (ST) from the mobile can not be obtained in the *Call Established* state; see *Force ST* softkey on p. 4.59.

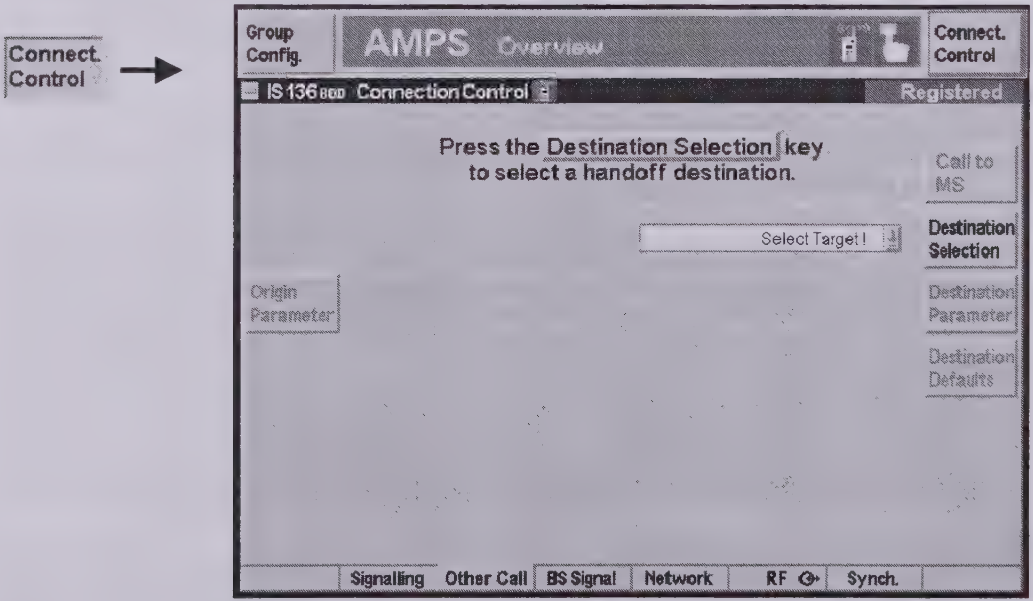
Remote control

```
PROCedure:SIGNalling:ACTion FST
```

Call to Another Network (Connection Control – Other Call)

The *Other Call* tab sets up a call from the current *(Origin)* to a different *(Destination)* network. While the call is still set up in the origin network (via CC), the voice channel is in the destination network. Therefore, in contrast to a *Handoff* procedure (see p. 4.70), an *Other Call* is possible in the *Signal On* or *Registered* signalling states only. The call process includes:

- Selection of the target network *(Destination Selection)* and special parameters of this network *(Destination Parameter, Destination Defaults)*
- Start of the call procedure *(Call to MS)*
- Return to of the original network *(Origin Parameter)*



Press the Destination Selection key to select a handoff destination.

Fig. 4-38 Connection Control – Other call (destination selection)

Destination Selection

The softkey *Destination Selection* selects the target network for the call.

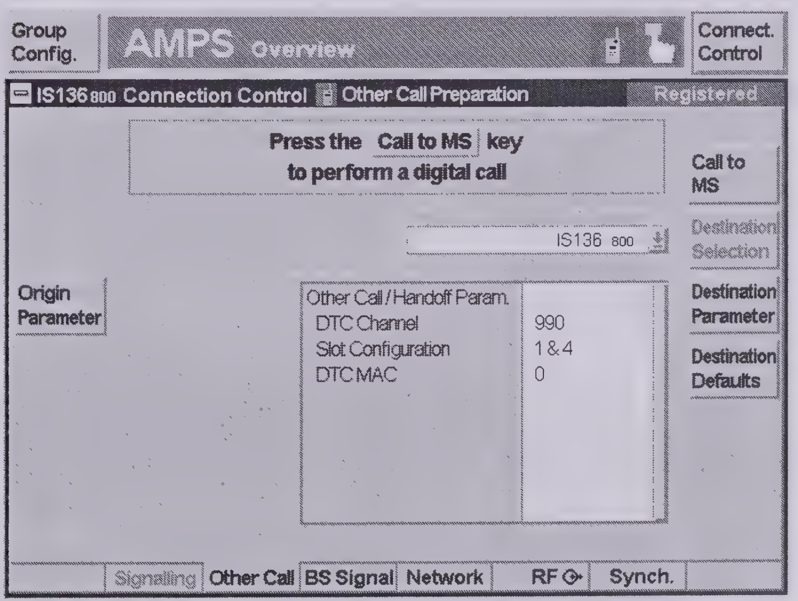
If the current function group is *AMPS-MS*, the default list of target networks contains the 800 MHz and the 1900 MHz band of the digital IS 136 network (provided that the mobile under test can be operated in these target networks). Furthermore, an *Other Call* destination with fallback (e.g. *IS 136 800 (Fallback))* means that the CMU returns to the function group of the origin network after the call is released.

Once the selection of the target network is confirmed via *Enter,* the CMU changes to the *Reg. Pending* signalling state. In this state, the entire *Connection Control* menu is mapped onto the target function group, so it is possible to edit the *Destination Parameters* (see below), the *BS Signal*, and the *Network* parameters of the target network.

Remote control

```
STATus:OCALl:TARGet:LIST?
CONFigure:OCALl:TARGet <Target>
```

Note: Reg. Pending *is an intermediate signalling state that only occurs in the context of an Other Call process and is therefore not shown in Fig. 4-27 (page 4.51). For a complete overview of signalling states see Fig. 6.1 in chapter 6 of this manual.*



Press the Call to MS key to perform a digital call

IS136 800

Other Call / Handoff Param.	
DTC Channel	990
Slot Configuration	1&4
DTC MAC	0

Fig. 4-39 Connection Control – Other Call (destination network preparation)

Destination Parameter

The *Destination Parameter* softkey sets important target network parameters that come into effect as soon as the call is established.

The entries depend on the target network selected via *Destination Selection*. For *AMPS* destination networks, the following list is provided:

Voice Channel	Number of the *voice* channel used in the destination network.
VMAC	Voice mobile attenuation code (set at the mobile), see Table 4-3 on page 4.57.

More destination parameters can be set in the *BS Signal* (see p. 4.72 ff) and the *Network* tabs (see p. 4.74 ff).

Remote control

```
CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel <Channel>
CONFigure:NETWork:OCHandoff[:MS]VMAC <MAC>
```

Destination Defaults

The *Destination Defaults* softkey resets all changed *Destination Parameters* to default values.

The softkey is disabled if no changes have been made in the *Destination Parameter* list.

Remote control
`CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel DEF`
`CONFigure:NETWork:OCHandoff[:MS]VMAC DEF`

Call to MS

The *Call to MS* initiates the call to the target network.

Remote control
`PROCedure:SIGNalling:ACTion OCALl`

Origin Parameter

The *Origin Parameter* softkey cancels the *Other Call* and resets the CMU to the previous signalling state *(Signal On* or *Registered;* see Fig. 4-38*)*.

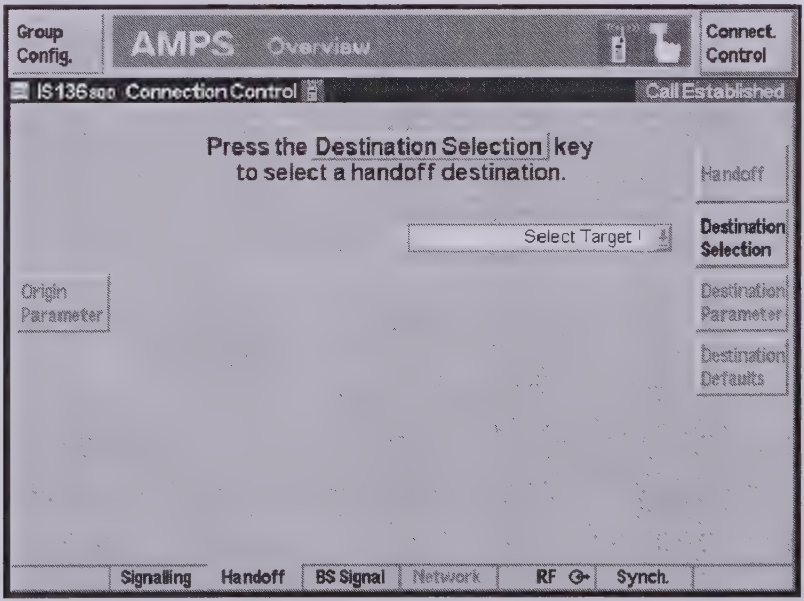
The destination parameters set in the *Reg. Pending* state are maintained. To drop the *Other Call* and return to the measurement mode, press the *ESCAPE* key or the *Connection Control* softkey.

Handoff to another Network (Connection Control – Handoff)

The *Handoff* tab initiates a handoff of the call connection to a different network. It is therefore available in the *Call Established* signalling state only. The handoff process includes:

- Selection of the target network *(Destination Selection)* and the handoff parameters *(Destination Parameter, Destination Defaults)*
- Start of the handoff procedure *(Handoff)*
- Return to the original network *(Origin Parameter)*

Connect. Control →



Press the Destination Selection key to select a handoff destination.

Fig. 4-40 Connection Control – Handoff (destination selection)

Destination Selection

The softkey *Destination Selection* selects the target network for handoff.

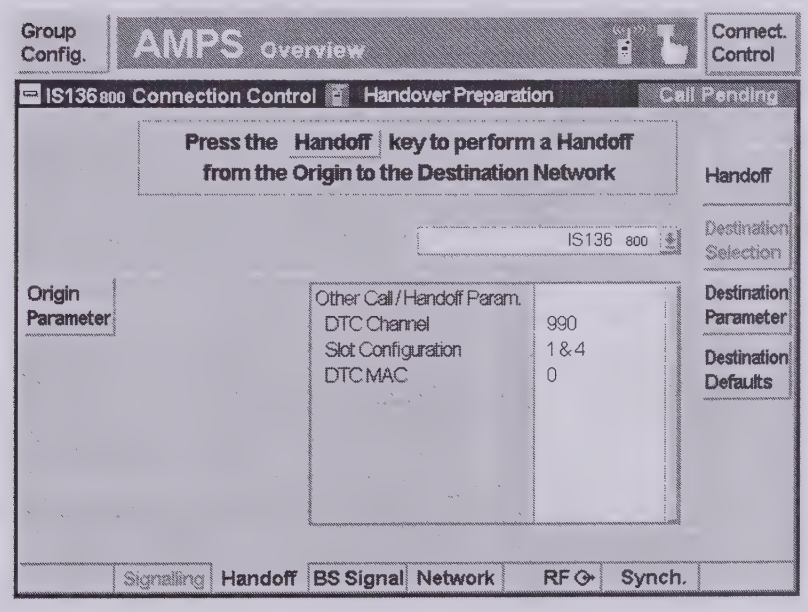
For function group *AMPS-MS*, handoff to the 800 MHz and the 1900 MHz band of the digital IS 136 network is provided. Furthermore, a *Handoff* destination with fallback (e.g. *IS 136 800 (Fallback))* means that the CMU returns to the function group of the origin network after the call is released. The target network list may be restricted if the mobile under test does not support all target networks.

Once the selection of the target network is confirmed via *Enter,* the CMU changes to the *Call Pending* signalling state. In this state, the entire *Connection Control* menu is mapped onto the target function group, so it is possible to edit the *Destination Parameters* (see below), the *BS Signal*, and the *Network* parameters of the target network.

Remote control

```
STATus:HANDoff:TARGet:LIST?
CONFigure:HANDoff:TARGet <Target>
```

Note: *Call Pending is an intermediate signalling state that only occurs in the context of a handoff process and is therefore not shown in Fig. 4-27 (page 4.51). For a complete overview of signalling states see Fig. 6.1 in chapter 6 of this manual.*



Press the Handoff key to perform a Handoff from the Origin to the Destination Network

IS136 800

Other Call / Handoff Param.	
DTC Channel	990
Slot Configuration	1 & 4
DTC MAC	0

Fig. 4-41 Connection Control – Handoff (destination network preparation)

Destination Parameter

The *Destination Parameter* softkey sets the parameters of the target network for handoff.

The entries depend on the target network selected via *Destination Selection*. For *AMPS* destination networks, the following list is provided:

Voice Channel	Number of the BS *voice* channel used in the destination network.
VMAC	Voice mobile attenuation code (set at the mobile), see Table 4-3 on page 4.57.

More destination parameters can be set in the *BS Signal* tab, see section *Signal Parameters (States Signal Off/On, Registered)* on page 4.72.

Remote control

```
CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel <Channel>
CONFigure:NETWork:OCHandoff[:MS]VMAC <MAC>
```

Destination Defaults

The *Destination Defaults* softkey resets all changed *Destination Parameters* to default values.

Remote control

```
CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel DEF
CONFigure:NETWork:OCHandoff[:MS]VMAC DEF
```

Handoff

The *Handoff* softkey initiates handoff to the target network.

Remote control

```
PROCedure:SIGNalling:ACTion HANDoff
```

Origin Parameter

The *Origin Parameter*softkey cancels the *Handoff* procedure and resets the CMU to the *Call Estabished* signalling state (see Fig. 4-40).

The destination parameters set in the *Call Pending* state are maintained. To drop the *Handoff* procedure and return to the measurement mode, press the *ESCAPE* key or the *Connection Control* softkey.

Signals of the CMU (Connection Control – BS Signal)

The popup menu *BS Signal* configures the signals of the CMU (which simulates a base station transmitting a control channel (CC) and a voice channel (VC) signal plus several signals in the AF range), selects the speech coder and transmit data. The functionality of the menu depends on the signalling state:

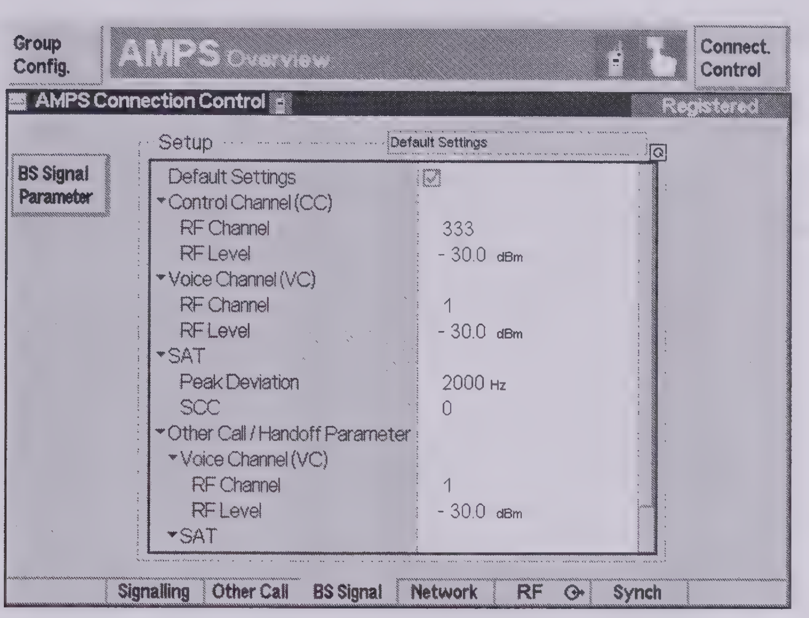
- Most signal parameters must be set before a call is set up to the mobile station. They are available in the signalling states *Signal Off, Signal On* and *Registered*.
- The VC level can still be changed after the call has been set up, i.e. in the Signalling state *Call Established*.

Signal Parameters (States Signal Off/On, *Registered*)

The popup menu *BS Signal (Signal On)* configures the signals of the CMU. This includes:

- The parameters of the control and voice channels and the SAT
- For processes switching between different networks, the voice channel and SAT parameters in the destination network *(Other Call/Handoff Parameters)*

Connect. Control →



Default Settings ☑
- Control Channel (CC)
  - RF Channel 333
  - RF Level - 30.0 dBm
- Voice Channel (VC)
  - RF Channel 1
  - RF Level - 30.0 dBm
- SAT
  - Peak Deviation 2000 Hz
  - SCC 0
- Other Call / Handoff Parameter
  - Voice Channel (VC)
    - RF Channel 1
    - RF Level - 30.0 dBm
  - SAT

Fig. 4-42 Connection Control – BS Signal (Signal On)

BS Signal Parameter The softkey *BS Signal Parameter* activates the input of parameters for the signals transmitted by the CMU.

The control and voice channels are configured separately.

Default Settings The *Default Settings* switch assigns default values to all parameters of the popup menu *BS Signal*. See command description in chapter 6 of this manual.

Control channel / Voice channel / SAT The sections *Control Channel (CC)* and *Voice Channel (VCH)* define the channel number, RF level of the control and voice channel signals and of the SAT generated by the CMU. See section *Signalling Control with Call Established* on page 4.66.

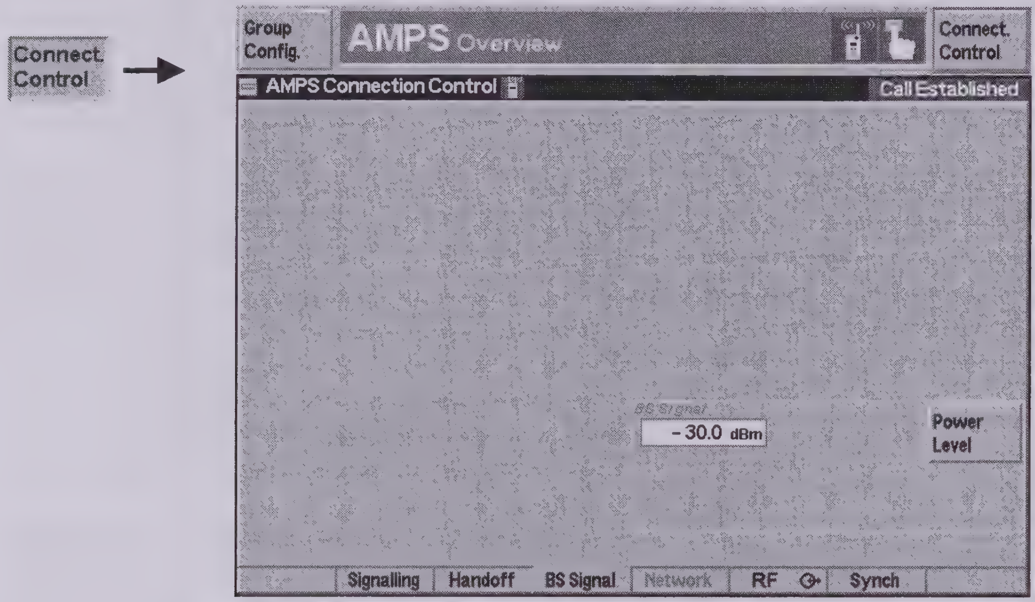
Remote control `CONFigure:BSSignal:ACC:CHANnel <ACChannel>`
`CONFigure:BSSignal:ACC:LEVel <Level>` etc.

Other Call / Handoff Parameter The *Other Call / Handoff Parameter* section defines voice channel (VC) and SAT parameters of the mobile in the current network, which come into effect if the call is set up or handed off from another network. See sections *Call to Another Network (Connection Control – Other Call)* on page 4.68 and *Handoff to another Network (Connection Control – Handoff)* on page 4.70.

Remote control `CONFigure:BSSignal[:AVC]:CHANnel <VCHannel>` etc.

Signal Parameters (State Call Established)

The popup menu *BS Signal (Call Established)* allows to change the level of the voice channel (Power Level) while a call connection is established.



BS Signal -30.0 dBm

Fig. 4-43 Connection Control – BS Signal (Call Established)

All settings are explained in the previous section (section Signal Parameters (States Signal Off/On, *Registered*) on page 4.72.

Remote control `PROCedure:BSSignal[:AVC]:LEVel <Level>`

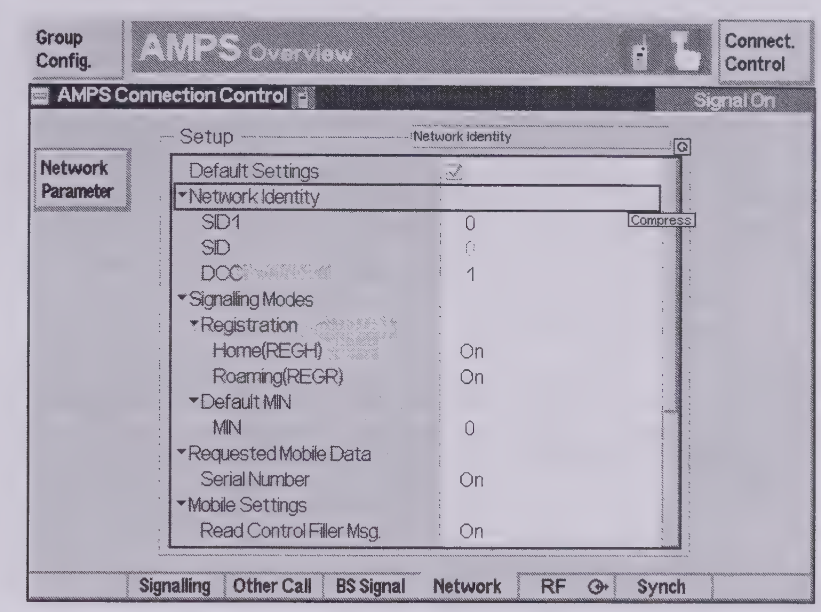
Network Parameters (Connection Control – Network)

The popup menu *Network* defines various parameters of the network and the mobile station. This includes

- Parameters characterizing the network *(Network Identity)*
- Control parameters for Registration and default IMSI *(Signalling Modes)*
- Parameters of the mobile station that are requested by the CMU during registration or when a call is being established *(Requested Mobile Data)*
- Parameters characterizing the mobile phone *(Mobile Settings)*
- *System Parameters*
- *Timeouts*
- For processes switching between different networks, voice channel parameters in the destination network *(Other Call/Handoff Parameter).*

This menu is not available in the *Alerting* and in the *Call Established* signalling states.

Connect. Control →



Setup	
Default Settings	✓
▾Network Identity	
SID1	0
SID	0
DCC	1
▾Signalling Modes	
▾Registration	
Home(REGH)	On
Roaming(REGR)	On
▾Default MIN	
MIN	0
▾Requested Mobile Data	
Serial Number	On
▾Mobile Settings	
Read Control Filler Msg.	On

Fig. 4-44 Connection Control – Network parameters

Network Parameter The *Network Parameter* softkey activates the associated table for entering or selecting various parameters of the network and the mobile station.

Network Identity The field *Network Identity* contains the parameters identifying the radio network:

SID 1	14-bit System Identity *(SID 1)* – a unique number identifying the cellular system (network). Together with a 1-bit identifyer for the channel system A or B, the SID 1 forms the 15-bit *SID* (see also section *Signalling Control without Signal (State Signal Off)* on page 4.51 ff).
DCC	Digital Color Code – a digital signal transmitted by the base station on a forward analog control channel that is used to detect capture of a base station by an interfering mobile station.

Remote control

```
CONFigure:NETWork:IDENtity:SID1 <Code>
CONFigure:NETWork:IDENtity:DCC  <Code>
```

Signalling Modes The *Signalling Modes* field determines signalling parameters that the CMU sends to the mobile station to control its function (the parameters for CMU signals, on the other hand, are set in the popup menu BS-Signal, see section Signal Parameters (States Signal Off/On, Registered) on page 4.72). The parameters refer to:

- *Registration,*
- Input of a mobile station identification *(Default MIN).*

Registration The section *Registration* defines when a registration procedure is to be executed. All of the following registration type parameters can be switched *On* and *Off*:

Home (REGH)	Registration for home mobile stations allowed/not allowed. A home mobile station is a MS operating in the cellular system (network) from which service is subscribed.
Roaming (REGR)	Registration for roaming mobile stations allowed/not allowed. A roaming mobile station is a MS operating outside the cellular system (network) from which service is subscribed.

Registration is the process by which the mobile phone identifies itself to the network and makes itself available for service. Registration may be in order in many cases where the operating mode of the mobile is changed.

In practice, when the mobile encounters a registration type, it checks whether the associated registration parameter is set. If this is true, it sends a registration message including the registration type to the network. The network may either accept or reject registration. After successful registration of the mobile phone under test, the CMU passes on to the signalling state *Registered*.

Remote control

```
CONFigure:NETWork:SMODe:REGH ON | OFF
CONFigure:NETWork:SMODe:REGR ON | OFF
CONFigure:NETWork:SMODe:IDMin <Code>
```

Default MIN

The section *Default MIN* defines the 34-bit mobile station identification number (MIN) which is used to set up a call to the mobile. Thus, the default setting enables a call to a mobile station with known MIN which is not registered yet.

If the MIN is not known, a call can still be set up from the mobile. In this case (and if the mobile initiates a registration, see above) the actual MIN of the mobile station supersedes the default MIN as soon as it is transferred to the tester.

Remote control

```
CONFigure:NETWork:SMODe:IDMin <Code>
```

Requested Mobile Data

The field *Requested Mobile Data* determines the signalling parameters of the mobile station to be requested during registration and displayed in the *Connection Control – Signalling (Registered)* menu (see page 4.63 ff.):

Serial Number	Request of the mobile's serial number *(On)* or no request *(Off)*.

Remote control

```
CONFigure:NETWork:SNUMber  ON | OFF
```

Mobile Settings

The field *Mobile Settings* defines whether the mobile must read a control filler message (RCF, setting *ON)* before accessing a system on a reverse analog control channel.

CMAC / VMAC

The *MAC (mobile attenuation code)* for control channel and voice channel signals *(CMAC* and *VMAC)* determines the output power at which the mobile station sets up a call to the network and performs a registration. The MAC scale defined in the standard is listed in Table 4-3 on page 4.57 ff.

Remote control

```
CONFigure:NETWork[:MS]:CMAC  0 to 7
CONFigure:NETWork[:MS]:VMAC  0 to 7
CONFigure:NETWork[:MS]:RCFM  ON | OFF
```

Timeouts

The *Timeouts* field defines a timeout period after which an interrupted radio link is aborted:

Loss of Radiolink	Time (in s) after which the CMU drops an established but interrupted connection (e.g. due to low signal level).
Registration period	Time period in s after which the CMU forces the mobile station to (re-)register (or *Off,* for no forced registration). With forced registration, it is possible to return to the *Registered* state automatically if the BS signal is temporarily switched off.

The time limit is of particular importance in remote-control mode. For example, the remote-control program will not be able to continue if the keyboard of the mobile station is defective and the mobile is therefore not able to answer the call.

Remote control

```
CONFigure:NETWork:TIMeout:LORLink  <Time>
CONFigure:NETWork:TIMeout:RPERiod  <Time>
```

Other Call / Handoff Parameter	The *Other Call / Handoff Parameter* section defines the *VMAC* of the mobile in the current network, which comes into effect if the call is set up or handed off from another network; see sections *Call to Another Network (Connection Control – Other Call)* on page 4.68 and *Handoff to another Network (Connection Control – Handoff)* on page 4.70. This can be used to set parameters that are relevant for a call connection without actually setting up a call.
Remote control	`CONFigure:NETWork:OCHandoff[:MS]:VMAC 0 to 7`

RF Connectors (Connection Control – Connector/Ext. Att.)

The popup menu *↔/Ext. Att.* selects the connectors for RF signals. This includes determination of

- RF input and RF output at the CMU *(RF Output, RF Input)*,
- An external attenuation at the connectors *(Ext. Att. Output, Ext. Att. Input)*.

The functions of this menu are described in the section *AMPS-MS Non Signalling* on page 4.44.

Reference Frequency (Connection Control – Synch.)

The popup menu *Synch.* determines the reference signal for synchronization. This includes

- The selection of internal or external reference frequency,
- The output mode for the reference frequency *(F REF OUT 2)*.

The functions of this menu are described in the section *AMPS-MS Non Signalling* on page 4.46.

Group Configuration

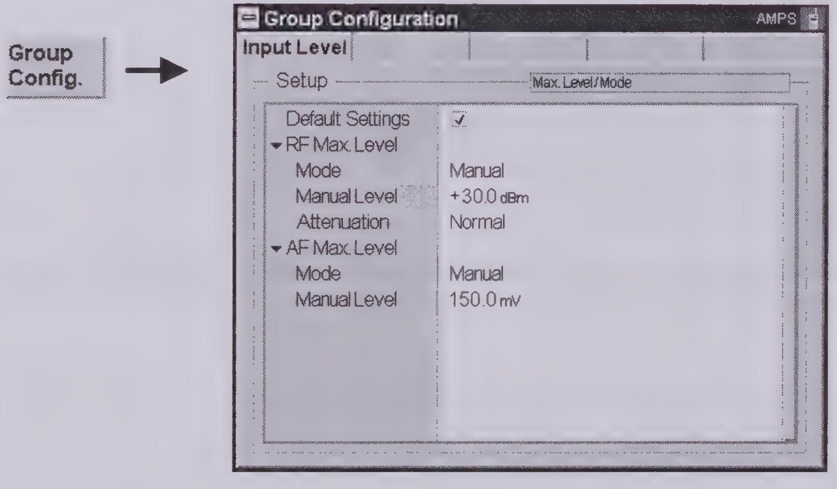
The popup menu *Group Configuration* configures the function group *AMPS-MS Signalling* globally, i.e., it provides settings that are valid for all measurement menus within the function group. Most of these settings can be overwritten in the individual graphical measurement menus using softkeys and popup input fields.

The popup menu *Group Configuration* is activated by pressing the softkey *Group Config.* at the top left of each measurement menu. Pressing the associated hotkeys permits to change between the tabs.

Input Level (Group Configuration – Input Level)

The tab *Input Level* provides general settings for the measured AF and RF input level (see also section *Connection Control* on page 4.38 ff.):

- *Reference*
- *Max. Level*
- *Attenuation* or gain



Default Settings ✓
RF Max. Level
Mode Manual
Manual Level +30.0 dBm
Attenuation Normal
AF Max. Level
Mode Manual
Manual Level 150.0 mV

Fig. 4-45 Group Configuration – input level

The functions of this menu are described in the section *AMPS-MS Non Signalling* on page 4.48. Note that here, in contrast to the *Non Signalling* mode, the input level can be set corresponding to the VMAC of the connected mobile phone.

Max. Level – Mode

The *Mode* field sets the maximum expected RF input level.

Manual	Manual input of maximum input level
VMAC	Input level corresponding to the voice mobile attenuation code of the mobile station.

Remote control `[SENSe:]LEVel:MODE MANual | VMAC`

Contents

5 Remote Control – Basics 5.1

Structure of the AMPS-MS Function Groups 5.1

Measurement Control 5.2

Measurement Groups 5.2

Measurement Statistics 5.3

Specifying Limits 5.4

Status Reporting System 5.5

Special Terms and Notation 5.6

5 Remote Control – Basics

This chapter gives a survey of the basic features and concepts of AMPS-MS remote control commands. Remote control can be described in terms analogous to the ones used in chapter 3 for the classification of measurement and configuration menus. In the following, we will particularly point out the similarities and differences between manual and remote control.

Structure of the AMPS-MS Function Groups

Chapter 6 of this manual lists gives a description of all AMPS-MS remote control commands, including their parameters, as well as the default values and ranges of all numerical parameters.

Test modes In chapter 6, the commands for the two test modes *Signalling* and *Non Signalling* are listed separately. The commands for the measurement groups `TXTests`, `TXAFresp`, `TXTests`, `TXAFresp` are identical in both test modes, so they are reported only once.

Addressing The CMU uses extended addressing: The instrument is assigned a primary address while each function group and test mode is identified via a secondary address. This allows the same remote commands to be used in several function groups and modes:

```
ibwrt(h_AMPS_SIG, "INITiate:TXTests:MODulation")
ibwrt(h_AMPS_NSIG, "INITiate:TXTests:MODulation")
```

provided that the variables `h_AMPS_SIG`, `h_AMPS_NSIG` have been appropriately defined, see program examples in chapter 7 of the CMU operating manual.

The remote control commands for first `(SYST:COMM:GPIB:ADDR)` and secondary `(SYST:REM:ADDR:SEC)` addressing are described in the CMU operating manual.

Order of commands The commands are arranged to form groups belonging to the same measurement or to the same type of configurations. These command groups are identified by the second-level keyword (as in `TXTests`). Applications belonging to a measurement group (see chapter 5 of the CMU operating manual) are identified by the third-level keyword of each command (as in `TXTests:MODulation`). Chapter 6 is organized as follows:

AMPS-MS Non Signalling:

General configurations (`LEVEL, AFLevel, RFANalyzer, RFGENerator, AFANalyzer, AFGenerator, MODGenerator, SAT, ST, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`).

Measurement groups (identical in Signalling and Non Signalling mode):

`TXTests:MODulation, TXTests:HNOIse, TXTests:AFLevel, TXAFresp, RXTests:MODulation, RXTests:HNOIse, RXTests:AFLevel, RXAFresp`.

AMPS-MS Signalling:

General configurations and signalling (`LEVel, AFLevel, AFGenerator, MODGenerator, SIGNalling, HANDover, BSSignal, NETWork, INPut, OUTPut, CORRection:LOSS, DM:CLOCk`).

Measurement groups (`WPOWer, MSSinfo`).

The structure of chapter 6 differs from chapter 4 *(Functions and their Applica-*

tion) where the measurements are presented first and configurations pertaining to the whole function group and test mode are reported at the end of each section.

The menu of the graphical user interface corresponding to a group of commands is quoted at the beginning of each section. Alphabetical lists of all commands are annexed to chapter 6.

SCPI Conformity

In view of the particular requirements of AMPS-MS measurements, not all commands could be taken from the SCPI standard. However, the syntax and structure of all commands is based on SCPI rules. For a detailed description of the SCPI standard refer to chapter 5 of the CMU operating manual.

SCPI confirmed and SPCI approved commands are explicitly marked throughout chapter 6.

Remote Control

All commands may be used for control of the CMU via GPIB interface or serial (RS-232) interface.

Measurement Control

The commands in the measurement groups quoted above (`WPOWer`, `TXTests...`, `RXTests... etc.`) have an analogous structure and syntax. The measurements are controlled according to the common concepts outlined in Chapter 5 of the CMU operating manual. The following sections show how the general concepts are applied to AMPS-MS measurements.

Measurement Groups

The measurement groups are referred to as *measurement objects* (keyword <meas_obj>) in remote control. For AMPS-MS measurements, the following measurement objects are defined:

Table 5-1 Measurement objects in the *Signalling* and *Non Signalling* mode

AMPS-MS Non Signalling	AMPS-MS Signalling
–	**WPOWer** Wide-band peak power measurement of the input signal.
TXTests Quantities characterizing the mobile transmitter quality (`TXTests:MODulation`, `TXTests:HNOIse`, `TXTests:AFLevel`), measured with variable RF and AF output signals of the CMU, including limit check.	**TXTests** Quantities characterizing the mobile transmitter quality (`TXTests:MODulation`, `TXTests:HNOIse`, `TXTests:AFLevel`), measured with variable RF channels and AF output signals of the CMU and at variable VMAC level of the mobile phone, including limit check.
TXAFresp Electrical audio frequency response of the MS transmitter including limit check.	**TXAFresp** Electrical audio frequency response of the MS transmitter at variable VMAC level of the mobile phone including limit check.
RXTests Quantities characterizing the mobile receiver quality (`RXTests:AFANalyzer`, `RXTests:HNOIse`, `TXTests:SENSitivity`), measured with variable RF CMU output signals, including limit check.	**RXTests** Quantities characterizing the mobile receiver quality (`RXTests:AFANalyzer`, `RXTests:HNOIse`, `TXTests:SENSitivity`), measured with variable RF CMU output signals and at variable VMAC level of the mobile phone,

AMPS-MS Non Signalling	AMPS-MS Signalling
	including limit check.
`RXAFresp` Electrical audio frequency response of the MS receiver including limit check.	`RXAFresp` Electrical audio frequency response of the MS receiver at variable VMAC level of the mobile phone including limit check.

The measurement objects in Table 5-1 are complemented by groups of commands used to retrieve results that are automatically provided by the mobile station (e.g. the receiver parameters reported by the mobile phone). These command groups do not represent real measurement objects; they consist of queries only and are called pseudo measurement objects. For an overview, see the list of remote control commands at the end of chapter 6.

Measurement Statistics

A single shot AMPS measurement (called one measurement cycle) lasts until valid (stable) results can be obtained. As a consequence, no *Statistic Count* can be defined; and there is no equivalent to the `CONFigure:<meas_obj>:CONTrol SCALar | ARRay, 1 ... 1000 | NONE` commands available in digital networks. The *Repetition Mode,* however, can be set using the `CONFigure:<meas_obj>:CONTrol:REPetition...` commands (see Table 5-2 below).

In many instances, the average, minimum or maximum over several measurement cycles is calculated. This aspect is explained in chapter 3 of this manual.

Table 5-2 Repetition mode in remote control

Setting	Description	Command

Repetition mode
Single Shot
	The measurement is stopped after one cycle.	`CONFigure:<meas_obj>:CONTrol:REPetition`
		`SINGleshot, <StopCondition>, <Stepmode>`
		`(<meas_obj> = TXTests:<Applic> | TXAFresp |`
		`RXTests:<Applic> | RXAFresp)`

Continuous	The measurement is continued until stopped explicitly or by a limit failure. The statistics window for the calculation of average results is continuously shifted (continuous averaging).	`CONFigure:<meas_obj>:CONTrol:REPetition`
		`CONTinuous, <StopCondition>, <Stepmode>`
		`(<meas_obj> = TXTests:<Applic> | TXAFresp |`
		`RXTests:<Applic> | RXAFresp)`

Counting	Repeated single shot measurement with configured measurement cycles.	`CONFigure:<meas_obj>:CONTrol:REPetition`
		`1 ... 10000, <StopCondition>, <Stepmode>`
		`(<meas_obj> = TXTests:<Applic> | TXAFresp |`
		`RXTests:<Applic> | RXAFresp)`

Specifying Limits

The following table gives an overview of the types of limits and possible results of the limit check.

Table 5-3 Limits and limit check

Type	Description	Command
Scalar limits	Limit values for a single (scalar) measured quantity. Depending on the measured quantity, upper or lower limits can be defined.	`CONFigure:<meas_obj>:LIMit <LowerLimit_1>|<UpperLimit_1>, <LowerLimit_2>|<UpperLimit_2>, ...` `<meas_obj>` denotes the measurement groups `TXTests` or `RXTests` with their applications.

Limit lines	For audio frequency response (`TXAFresp` or `RXAFresp`) measurements, a tolerance template consisting of several areas can be defined.	`CONFigure:<meas_obj>:LIMit[:LINE] [:ASYMmetrical]:UPPer <Limit_line_param.>`
		`CONFigure:<meas_obj>:LIMit[:LINE] [:ASYMmetrical]:LOWer <Limit_line_param.>`
		`<meas_obj>` denotes the measurement groups `TXAFresp` or `RXAFresp.`
		`<Limit_line_param.>` denotes a list of limit values an enable/disable variable for each area.

	The areas of the tolerance template can be defined and enabled separately.	`CONFigure:<meas_obj>:LIMit[:LINE] [:ASYMmetrical]:UPPer:TONE<nr> <Limit>, <Enable>`
		`CONFigure:<meas_obj>:LIMit[:LINE] [:ASYMmetrical]:LOWer:TONE<nr> <Limit>, <Enable>`
		`<meas_obj>` denotes the measurement groups `TXAFresp` or `RXAFresp.`

Limit check	All scalar limits belonging to the same measurement group are read out together with the command on the right side.	`CALCulate[:SCALar]:<meas_obj.> [:RESult]:MATChing:LIMit?` `<meas_obj>` denotes the measurement groups `TXTests` or `RXTests` with their applications.
	Possible results of the scalar limit check are listed on the right side. Further messages assessing, e.g., the power ramp or the result of the BER test in general, may be issued in particular cases (see detailed command description in chapter 6).	`NMAU` not matching, underflow `NMAL` not matching, overflow `INV` measured value invalid `OK` no limit failure

	Limits for different areas can be evaluated with a single combined command or for each area separately.	`CALCulate[:SCALar]:<meas_obj.> [:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?`
		`CALCulate[:SCALar]:<meas_obj.> [:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?`
		`<meas_obj>` denotes the measurement groups `TXAFresp` or `RXAFresp.`

Status Reporting System

A general description of SCPI status registers and of the status reporting system is given in chapter 5 of the CMU operating manual. This section is devoted to the particular features concerning AMPS-MS measurements.

The CMU offers 30 independent `STATus:OPERation:CMU:SUM1|2:CMU<nr>` sub-registers (<nr>=1 ... 15) which are implemented in hierarchical form. The bits of the 30 `STATus:OPERation` registers are set only after the registers are assigned to a function group and measurement mode.

In the `CONDition` part, the `STATus:OPERation` register contains information on which actions the instrument is being executing or, in the `EVENt` part, information on which actions the instrument has executed since the last readout. All fife parts of the registers can be read using one of the commands of the subsystem `STATus:OPERation:SUM1|2:CMU<nr>:...`

AMPS-MS mobile tests comprise the two signalling modes *Non Signalling* and *Signalling* so that 2 different secondary addresses are used. In the status register for the *Non Signalling* mode the bit assignment is as follows:

Table 5-4 Meaning of the bits used in the `STATus:OPERation:CMU:SUM1|2:CMU<nr>` sub-registers assigned to *AMPS-MS Non Signalling*

Bit-No.	**Meaning**	**Symbol in `STAT:OPER:SYMB...`**
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS

In the status register for the *Signalling* mode the bit assignment is as follows:

Table 5-5 Meaning of the bits used in the **`STATus:OPERation:CMU:SUM1|2:CMU<nr>`** sub-registers assigned to *AMPS-MS Signalling*

Bit-No.	**Meaning**	**Symbol in `STAT:OPER:SYMB...`**
0	**Call from Mobile** This bit is set when the CMU receives a call from the mobile under test.	CFM
1	**Release from Mobile** This bit is set when the connection to the mobile is being released.	RFM
2	**Loss of Radio Link** This bit is set if the CMU had to leave the signalling state "Call Established" (because of a low signal etc.).	LORL
3	**Mobile Registered** This bit is set when a registration was successfully performed.	MREG
6	**Reference Frequency not synchronized** This bit is set if the reference frequency is not synchronized.	RFNS
7	**Mobile Deregistered** This bit is set if the CMU had to leave the signalling state "Registered" (because of a low signal etc.).	MDER
9	**Traffic Channel Active** This bit is set when voice data is transmitted via the analog voice channel.	TCH

Bit-No.	Meaning	Symbol in `STAT:OPER:SYMB...`
11	**RF Input overdriven** This bit is set if one of the three RF input connectors is overdriven.	RFIO
12	**RF Input underdriven** This bit is set if one of the three RF input connectors is underdriven.	RFIU
13	**AF Input overdriven** This bit is set if the AF input connector AF IN is overdriven.	AFIO
14	**AF Input underdriven** This bit is set if the AF input connector AF IN is underdriven.	AFIU

Special Terms and Notation

Below we list some particular features in the syntax of the AMPS-MS commands. The general description of the SCPI command syntax can be found in chapter 5 of the CMU operating manual, section *"Structure and Syntax of Device Messages"*.

Description of commands

The commands are arranged in tables. From top to bottom, the table rows contain the following entries:

1. Complete command syntax including the parameter list and a short description of the command
2. List and description of the parameters with their default values, the units and unit rings
3. Detailed description of the command, signalling state required for command execution (in *Signalling* mode), required firmware version

Detailed lists of default values are annexed to the command description. Occasionally, groups of analogous commands are described in common tables.

Order of commands

The commands are arranged according to their function specified by the keyword in the second level or in the second/third level combined. Lower-level keywords define the command in more detail. This means that commands with the same second-level, third-level etc. keywords are generally grouped together in the same sections.

Example: `CONFigure:WPOWer:CONTrol:REPetition`

Commands with the keyword *`WPOWer`* in the second level belong to the wide-band power measurement. The keywords in the third and fourth level indicate that the command controls the repetition mode of the power measurement.

Measurement object

The term *measurement object* denotes a group of remote control commands belonging to the same group of measured quantities. E.g., all commands concerning the wide-band power measurement form a common measurement object.

A pseudo measurement object concerns quantities which do not actually have to be measured because they are automatically obtained during the signalling process (e.g. the receiver parameters reported by the mobile phone).

Combined measurements

To limit the number of remote control commands, scalar results are always measured together and output in lists.

Parameters

Setting commands are usually supplemented by a parameter or a list of several parameters. Parameters either provide alternative options (setting a or setting b or setting c ..., see special character "|"), or they form a list separated by commas (setting x,y).

<Par_Name>

In the command tables and lists, parameters are generally described by a name (literal) written in angle brackets (<>). This literal merely serves as a parameters description; in an application program it must be replaced by one of the possible settings reported in the detailed parameter description.

Example: `[SENSe:]AFLevel:MODE <Mode>`

with `<Mode>` `= MANual | AUTOmatic`

possible command syntax: `AFL:MODE MAN`

NAN

NAN (not a number) is generally used to represent missing data, e.g. if a portion of a trace has not been acquired yet. It is also returned after invalid mathematical operations such as division by zero. As defined in the SCPI standard, NAN is represented as 9.91 E 37.

INV

INV (invalid) is returned if a limit check is performed without defining the appropriate tolerance values.

Upper / lower case

Upper/lower case characters characterize the long and short form of the keywords in a command. The short form consists of all upper-case characters, the long form of all upper case plus all lower case characters. On the CMU, either the short form or the long form are allowed; mixed forms will generally not be recognized. Note that the instrument itself does not distinguish upper case and lower case characters.

Special characters

|

A vertical stroke in the parameter list characterizes alternative parameter settings. Only one of the parameters separated by | must be selected.

Example: The following command has two alternative settings:

`[SENSe:]AFLevel:DEFault ON | OFF`

[ ]

Key words in square brackets can be omitted when composing the command header (see chapter 5 of the CMU manual, section "Structure of a Command"). The complete command must be recognized by the instrument for reasons of compatibility with the SCPI standard.

Parameters in square brackets are optional as well. They may be entered in the command or omitted.

{ }

Braces or curly brackets enclose one or more parameters that may be included zero or more times.

<nr>

This symbol denotes a numeric suffix, e.g. an enumeration index for input and output connectors.

Lists of commands

Command:	The *Command* column of the table contains all remote control commands arranged according to their function (configurations or measurement objects). Within a section, the commands are listed in alphabetical order.
Parameters:	The *Parameter* column lists the parameters of the commands.
Remarks:	The *Remarks* column gives additional information about the commands which – Have no query form *(no query)* – Have only a query form *(query only)* – Can be used both as setting commands and as queries (*with query*, this applies to all commands belonging to none of the two preceding categories)
Alphabetical Lists	Chapter 6 concludes with alphabetical command lists for both test modes.

Contents

6 Remote Control – Commands 6.1

AMPS Module Tests (Non Signalling) **6.1**

Group Configuration 6.1
- Subsystem LEVel (RF Input Level) 6.1
- Subsystem AFLevel (AF Input Level) 6.3

Connection Control and Generators 6.4
- Subsystem RFANalyzer (Analyzed Input Signals) 6.4
- Generator Object "RFGenerator" – Generator control 6.5
  - Generator Level – Subsystem RFGenerator:LEVel 6.5
  - RF Generator Frequency – Subsystem RFGenerator:FREQuency 6.6
- Generator Object "AFGenerator" – Generator control 6.7
  - Generator Level – Subsystem AFGenerator:LEVel 6.7
  - AF Generator Frequency – Subsystem AFGenerator:FREQuency 6.7
- Generator Object "MODGenerator" – Generator control 6.8
  - Generator Level – Subsystem MODGenerator:LEVel 6.8
  - Mod. Generator Frequency – Subsystem MODGenerator:FREQuency 6.8
- Generator Object "SAT" – SAT Generator control 6.9
- Generator Object "ST" – ST Generator control 6.10
- Subsystem for Input and Output (External Attenuation at the Connectors) 6.11
- Subsystem DM:CLOCk (Network Clock) 6.12

Measurement Groups (Non Signalling and Signalling) **6.13**

Test Object WPOWer (Wide Band Power) 6.13

Test Object TXTests:MODulation 6.16
- Control of Measurement – Subsystem TXTests:MODulation 6.16
- Test Configuration 6.17
  - Subsystem TXTests:MODulation:CONTrol 6.17
  - Tolerance values – Subsystem TXTests:MODulation:LIMit 6.18
  - Path Configuration – Subsystem TXTests:MODulation:FILTer 6.19
- Measured Values – Subsystem TXTests:MODulation[:RESult] 6.20

Test Object TXTests:HNOise 6.21
- Control of Measurement – Subsystem TXTests:HNOise 6.21
- Test Configuration 6.22
  - Subsystem TXTests:HNOise:CONTrol 6.22
  - Tolerance values – Subsystem TXTests:HNOise:LIMit 6.23
  - Path Configuration – Subsystem TXTests:HNOise:FILTer 6.24
- Measured Values – Subsystem TXTests:HNOise[:RESult] 6.25

Test Object TXTests:AFLSearch 6.26
- Control of Measurement – Subsystem TXTests:AFLSearch 6.26
- Test Configuration 6.27
  - Subsystem TXTests:AFLSearch:CONTrol 6.27
  - Tolerance values – Subsystem TXTests:AFLSearch:LIMit 6.28
  - Path Configuration – Subsystem TXTests:AFLSearch:FILTer 6.29
- Measured Values – Subsystem TXTests:AFLSearch[:RESult] 6.30

Test Object TXAFresp 6.31

Control of Measurement – Subsystem TXAFresp 6.31
Test Configuration 6.32
Subsystem TXAFresp:CONTrol 6.32
Subsystem TXAFresp:TRACe 6.33
Subsystem SUBarrays:TXAFresp 6.34
Tolerance values – Subsystem TXAFresp:LIMit 6.35
Test Tones – Subsystem TXAFresp:TDEFinition 6.37
Test Tones – Subsystem TXAFresp:AFGenerator 6.38
Path Configuration – Subsystem TXAFresp:FILTer 6.41
Measured Values – Subsystem TXAFresp[:RESult] 6.42
Test Object RXTests:AFANalyzer 6.44
Control of Measurement – Subsystem RXTests:AFANalyzer 6.44
Test Configuration 6.45
Subsystem RXTests:AFANalyzer:CONTrol 6.45
Tolerance values – Subsystem RXTests:AFANalyzer:LIMit 6.46
Path Configuration – Subsystem RXTests:AFANalyzer:FILTer 6.47
Measured Values – Subsystem RXTests:AFANalyzer[:RESult] 6.48
Test Object RXTests:AFANalyzer:VMSinad 6.49
(Fast SINAD Measurement) 6.49
Control of Measurement – Subsystem RXTests:AFANalyzer:VMSinad 6.49
Test Configuration 6.50
Subsystem RXTests:AFANalyzer:VMSinad:CONTrol 6.50
Measured Values – Subsystem RXTests:AFANalyzer:VMSinad[:RESult] 6.51
Test Object RXTests:HNOise 6.52
Control of Measurement – Subsystem RXTests:HNOise 6.52
Test Configuration 6.53
Subsystem RXTests:HNOise:CONTrol 6.53
Tolerance values – Subsystem RXTests:HNOise:LIMit 6.54
Path Configuration – Subsystem RXTests:HNOise:FILTer 6.55
Measured Values – Subsystem RXTests:HNOise[:RESult] 6.56
Test Object RXTests:SENSitivity 6.57
Control of Measurement – Subsystem RXTests:SENSitivity 6.57
Test Configuration 6.58
Subsystem RXTests:SENSitivity:CONTrol 6.58
Tolerance values – Subsystem RXTests:SENSitivity:LIMit 6.59
Path Configuration – Subsystem RXTests:SENSitivity:FILTer 6.60
Measured Values – Subsystem RXTests:SENSitivity[:RESult] 6.61
Test Object RXAFresp 6.62
Control of Measurement – Subsystem RXAFresp 6.62
Test Configuration 6.63
Subsystem RXAFresp:CONTrol 6.63
Subsystem RXAFresp:TRACe 6.64
Subsystem SUBarrays:RXAFresp 6.65
Tolerance values – Subsystem RXAFresp:LIMit 6.66
Test Tones – Subsystem RXAFresp:TDEFinition 6.68
Test Tones – Subsystem RXAFresp:MODGenerator 6.69
Path Configuration – Subsystem RXAFresp:FILTer 6.72
Measured Values – Subsystem RXAFresp[:RESult] 6.73

AMPS Mobile Tests (Signalling Mode) 6.75

Channel Units – System UNIT 6.75

Group Configuration 6.75
    Subsystem LEVel (RF Input Level) 6.75
    Subsystem AFLevel (AF Input Level) 6.76
Connection Control 6.78
    Signalling – Subsystem SIGNalling (Call Setup and Cleardown) 6.78
    Subsystem OCALl (Other Call Target) 6.81
    Subsystem HANDoff (Handoff Target) 6.81
    Subsystem BSSignal (Signal of Base Station/CMU) 6.82
    Subsystem NETWork 6.85
        Subsystem NETWork:IDENtity 6.85
        Subsystem NETWork:SMODe (Signalling Modes) 6.85
        Subsystem NETWork:REQuest (Requested Mobile Data) 6.86
        Subsystem NETWork[:MS] (Mobile Settings) 6.86
        Subsystem NETWork:TIMeout 6.87
        Subsystem NETWork:OCHandoff 6.88
    Subsystem IOConnector (External Attenuation at the Connectors) 6.88
    Subsystem DM:CLOCk (Network Clock) 6.89
Pseudo Test Object MSSinfo 6.90
    (Signalling information of mobile phone) 6.90
    Generator Object "AFGenerator" – Generator control 6.92
        Generator Level – Subsystem AFGenerator:LEVel 6.92
        AF Generator Frequency – Subsystem AFGenerator:FREQuency 6.92
    Generator Object "MODGenerator" – Generator control 6.93
        Generator Level – Subsystem MODGenerator:LEVel 6.93
        Mod. Generator Frequency – Subsystem MODGenerator:FREQuency 6.93

List of Commands 6.94
Commands for AMPS-MS Measurements without Signalling 6.94
Commands for AMPS-MS Measurements with Signalling 6.102
Alphabetical Command Lists 6.110

6 Remote Control – Commands

In the following, all remote-control commands for the function groups *AMPS-MS* will be presented in tabular form with their parameters and the ranges of values. The structure of this chapter is analogous to that of the reference part for manual operation (chapter 4):

- The measurement modes *Non Signalling* and *Signalling* are presented separately.
- Within the measurement modes, first the general configuration and then the individual measurement groups (test objects) are dealt with.
- Measurement groups that are identical in both test modes *(`TXTests`, `TXAFresp`, `RXTests`, `RXAFresp`)* are presented in a separate section between the two test modes.

General notes on remote control in the function group *AMPS-MS* can be found in Chapter 5. An introduction to remote control according to SCPI standard and the status registers of the CMU is given in chapter 5 of the operating manual for the CMU basic instrument.

AMPS Module Tests (Non Signalling)

In the *Non Signalling* mode, the CMU generates an RF voice signal that can be frequency-modulated with an AF modulation signal, the SAT, and the ST, and analyzes the modulated RF carrier signal with AMPS characteristics and the audio signal retransmitted by the device under test. Receiver and transmitter tests can be performed; no signalling parameters are transferred.

Group Configuration

The remote-control commands in this section are used to configure the measurements in the function group *AMPS-MS Non Signalling* globally, i.e., they provide settings that are valid for all measurements within the function group. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Subsystem LEVel (RF Input Level)

The subsystem *LEVel* determines the input level for the currently used input. It corresponds to the RF section in the tab *Input Level* in the popup menu *Group Configuration*.

[SENSe:]LEVel:MODE <*Mode*>				Input level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MANual	Manual setting	MANual	–	
Description of command				FW vers.
This command defines the mode for setting the maximum input level.				V2.41

[SENSe:]LEVel:MAXimum *<Level>* Max. Level

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 dBm to +53 dBm	Maximum input level for RF 1	+30.0	dBm	
–14 dBm to 39 dBm	Maximum input level for RF 2	+30.0	dBm	
–37 dBm to 0 dBm	Maximum input level for RF 4 IN	+0.0	dBm	

Description of command	FW vers.
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).	V2.41

[SENSe:]LEVel:ATTenuation *<Mode>* Attenuation

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NORMal |	Mixer level in normal range	NORMal	–	
LNOise |	Low noise (mixer level 10 dB higher than in normal setting)			
LDIStortion	Low distortion (mixer level 10 dB lower than in normal setting)			

Description of command	FW vers.
This command tunes the RF analyzer for normal setting, low noise level (full dynamic range), or low distortion (high intermodulation spacing).	V2.41

[SENSe:]LEVel:DEFault Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Subsystem AFLevel (AF Input Level)

The subsystem *AFLevel* determines the input level for the currently used input. It corresponds to the AF section in the tab *Input Level* in the popup menu *Group Configuration*.

[SENSe:]AFLevel:MODE *<Mode>*				Input level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MANual |	Manual setting	MANual	–	
AUTomatic	Automatic setting corresponding to average power of signal applied			
Description of command				FW vers.
This command defines the mode for setting the maximum input level.				V2.41

[SENSe:]AFLevel:MAXimum *<Level>*				AF Max. Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 V to +30 V	Maximum audio input voltage	+0.15	V	
Description of command				FW vers.
This command defines the maximum expected AF input level.				V2.41

[SENSe:]AFLevel:DEFault				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.41

Connection Control and Generators

The remote-control commands presented in this section determine the RF analyzer settings and the signals generated by the CMU, the inputs and outputs used as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect. Control*, located to the right of the headline of each main menu. In addition, this section contains the commands concerning the *AF* and *Modulation* generators accessible via the *Analyzer/Generator* menu.

Subsystem RFANalyzer (Analyzed Input Signals)

The subsystem *RFANalyzer* configures the RF analyzer, i.e., it specifies which type of RF signals can be analyzed. It corresponds to the panel *Analyzer Settings* in the tab *Signal* in the popup menu *Connect. Control*.

[SENSe:]RFANalyzer:FREQuency *<Number>*				RF Channel
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
200 000 Hz to **2 700 000 000 Hz** (see also data sheet)	Input frequency (in multiples of 10 kHz)	825 030 000	Hz	
Description of command				FW vers.
This command defines the frequency of the RF signal analyzed. With the command `[SENSe:]RFANalyzer:FREQuency:UNIT`, the default frequency unit can be changed, and even AMPS channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the reverse channel (signal direction from mobile to CMU).				V2.41

[SENSe:]RFANalyzer:FREQuency:UNIT *<Unit>*				Frequency Unit
<Unit>	Description of parameters	Def. value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit | Channel number	Hz	Hz	
Description of command				FW vers.
This command defines whether the frequency of the RF signal analyzed is specified in frequency units or as an AMPS channel number. Frequency units must be used to select input signals that are outside the designated AMPS channel range.				V2.41

[SENSe:]RFANalyzer:FREQuency:OFFSet *<FreqOffset>*				Voice Ch. Offset
<FreqOffset>	Description of parameters	Def. value	Def. unit	Unit ring
–15 000 Hz to +15 000 Hz	Offset for channel frequency	0	Hz	
Description of command				FW vers.
This command defines an offset for the RF analyzer frequency set with the command `[SENSe:]RFANalyzer:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.				V2.41

Generator Object "RFGenerator" – Generator control

The subsystem *RFGenerator* configures the RF signals generated by the CMU. It corresponds to the softkey *Power Level* in the *Signal* tab of the popup menu *Connect. Control* and the measurement menu *Analyzer/Generator*.

INITiate:RFGenerator	Start RF generator, reserve resources	*RUN*
ABORt:RFGenerator	Switch off RF generator, release resources	*OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the RF generator, setting it to the status indicated in the top right column.		V2.41

FETCh:RFGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the current RF generator status.				V2.41

Generator Level – Subsystem RFGenerator:LEVel

The subsystem *RFGenerator:LEVel* determines the level of the generated RF signal. It corresponds to the input field *Power Level* of the panel *BS Signal Settings* in the *Signal* tab in the popup menu *Connect. Control* and the measurement menu *Analyzer/Generator*.

SOURce:RFGenerator:LEVel *<Level>*				Power Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm	Output level at RF1	–50	dBm	
–137 dBm to –10 dBm	Output level at RF2	–50	dBm	
–90 dBm to +13 dBm	Output level at RF 3 OUT	–50	dBm	
Description of command				FW vers.
This command determines the RF generator level. The value range depends on the used RF output of the CMU and the external attenuation set (see `[SENSe:]CORRection:LOSS:OUTPut<nr>[:MAGNitude]` command).				V2.41

RF Generator Frequency – Subsystem RFGenerator:FREQuency

The subsystem *RFGenerator:FREQuency* determines the frequency of the generated RF signals. It corresponds to the softkeys *Voice Channel* and *Voice Ch. Offset* of the panel *BS Signal Settings*.

SOURce:RFGenerator:FREQuency *<Number>*				Voice Channel
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
30 000 Hz to 2 700 000 000 Hz	Input frequency (in multiples of 10 kHz) (see also data sheet)	870 030 000	Hz	
Description of command				FW vers.
This command defines the frequency of the RF signal generated. With the command `SOURce:RFGenerator:FREQuency:UNIT`, the default frequency unit can be changed, and even AMPS channel numbers can be entered instead of frequencies. In the latter case, the assignment of channel numbers and frequencies meets the specification for the forward channel (signal direction from CMU to mobile under test).				V2.41

SOURce:RFGenerator:FREQuency:UNIT *<Unit>*				Frequency Unit
<Unit>	Description of parameters	Def. value	Def. unit	Unit ring
Hz | KHZ | MHZ | GHZ | CH	Frequency unit | Channel number	Hz	Hz	
Description of command				FW vers.
This command defines whether the frequency of the RF signal generated is specified in frequency units or as an AMPS channel number. Frequency units must be used to select input signals that are outside the designated AMPS channel range.				V2.41

SOURce:RFGenerator:FREQuency:OFFSet *<FrequencyOffset>*				Voice Ch. Offset
<FrequencyOffset>>	Description of parameters	Def. value	Def. unit	Unit ring
–15 000 Hz to +15 000 Hz	Frequency offset	0	Hz	
Description of command				FW vers.
This command defines an offset for the RF generator frequency set with the command `[SENSe:]RFGenerator:FREQuency <Number>`. The offset frequency must be in multiples of 1 Hz.				V2.41

Generator Object "AFGenerator" – Generator control

The subsystem *AFGenerator* configures the AF signals generated by the CMU. It corresponds to the softkey *AF Generator* in the measurement menu *Analyzer/Generator*.

INITiate:AFGenerator **ABORt:AFGenerator**	Start AF generator, reserve resources Switch off AF generator, release resources	*RUN* *OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the AF generator, setting it to the status indicated in the top right column.		V2.41

FETCh:AFGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command			Status	FW vers.
This command is always a query. It returns the current AF generator status.			all	V2.41

Generator Level – Subsystem AFGenerator:LEVel

The subsystem *AFGenerator:LEVel* determines the voltage of the generated AF signal. It corresponds to the *Level* input field assigned to the *AF Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:AFGenerator:LEVel *<Level>*				AF Voltage
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 V to 5 V	Effective (RMS averaged) voltage of the AF signal	0.2	V	
Description of command				FW vers.
This command determines the voltage of the AF signal.				V2.41

AF Generator Frequency – Subsystem AFGenerator:FREQuency

The subsystem *AFGenerator:FREQuency* determines the frequency of the generated AF signals. It corresponds to the *Frequency* input field assigned to the *AF Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:AFGenerator:FREQuency *<Frequency>*				AF Frequency
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
20 Hz to 20 000 Hz	AF frequency	1004	Hz	
Description of command				FW vers.
This command defines the frequency of the AF signal generated.				V2.41

Generator Object "MODGenerator" – Generator control

The subsystem *MODGenerator* configures the modulation signals generated by the CMU. It corresponds to the softkey *Mod. Generator* in the measurement menu *Analyzer/Generator*.

INITiate:MODGenerator **ABORt:MODGenerator**	Start Mod. generator, reserve resources Switch off Mod. generator, release resources	*RUN* *OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the modulation generator, setting it to the status indicated in the top right column.		V2.41

FETCh:MODGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the current modulation generator status.				V2.41

Generator Level – Subsystem MODGenerator:LEVel

The subsystem *MODGenerator:LEVel* determines the voltage of the generated modulation signal. It corresponds to the *Level* input field assigned to the *Mod. Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:MODGenerator:DEViation *<Deviation>*				Mod. Deviation
<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
0 Hz to 20000 Hz	Peak deviation	8000	Hz	
Description of command				FW vers.
This command determines the peak frequency deviation of the modulation signal.				V2.41

Mod. Generator Frequency – Subsystem MODGenerator:FREQuency

The subsystem *MODGenerator:FREQuency* determines the frequency of the generated modulation signals. It corresponds to the *Frequency* input field assigned to the *Mod. Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:MODGenerator:FREQuency *<Frequency>*				Mod. Frequency
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 15 999 Hz	Mod. frequency	1004	Hz	
Description of command				FW vers.
This command defines the frequency of the modulation signal generated.				V2.41

Generator Object "SAT" – SAT Generator control

The subsystem *SAT* configures the Supervisory Audio Tone (SAT) generated by the CMU. It corresponds to the softkey *SAT* in the *Signal* tab of the popup menu *Connect. Control* and the associated input fields.

INITiate:SAT **ABORt:SAT**	Start SAT generator, reserve resources Switch off RF generator, release resources	*RUN* *OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the SAT generator, setting it to the status indicated in the top right column.		V2.41

FETCh:SAT:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt or *RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the current SAT generator status.				V2.41

SOURce:SAT:PEAKdev <*Deviation*>				Peak Deviation
<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 20000 Hz	SAT peak deviation	2000	Hz	
Description of command				FW vers.
This command determines the peak deviation that the CMU uses to transmit the SAT.				V2.41

SOURce:SAT:SCC <*Code*>				SAT Color Code
<Code>	Description of parameters	Def. value	Def. unit	Unit ring
0 | 1 | 2	SAT Color Code (SCC)	2	–	
Description of command				FW vers.
This command determines the SAT Color Code and thus the frequency of the SAT (see chapter 4).				V2.41

Generator Object "ST" – ST Generator control

The subsystem *ST* configures the Signalling Tone (ST) generated by the CMU. It corresponds to the softkey *ST* in the *Signal* tab of the popup menu *Connect. Control* and the associated input fields.

INITiate:ST **ABORt:ST**	Start ST generator, reserve resources Switch off RF generator, release resources	*RUN* *OFF*
Description of command		FW vers.
These commands have no query form. They start and stop the ST generator, setting it to the status indicated in the top right column.		V2.41

FETCh:ST:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command				FW vers.
This command is always a query. It returns the current ST generator status.				V2.41

SOURce:ST:PEAKdev <*Deviation*>				Peak Deviation
<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 20000 Hz	ST peak deviation	8000	Hz	
Description of command				FW vers.
This command determines the peak deviation that the CMU uses to transmit the ST.				V2.41

SOURce:ST:DAT <*Enable*>				Data Signal
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	ST generator provides data signal ST generator provides ST	OFF	–	
Description of command				FW vers.
This command switches between the ST and a 10 kilobit/s wideband data signal.				V2.41

Subsystem for Input and Output (External Attenuation at the Connectors)

The subsystem for input and output configures the input and output connectors. The subsystem corresponds to the tab *RF* ⊕ in the popup menu *Connect. Control*.

INPut[:STATe] <*State*> RF Input

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 |	Connector RF 1 used as input	RF2	–	
RF2 |	Connector RF 2 used as input			
RF4	Connector RF 4 IN used as input			

Description of command	FW vers.
This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.	V2.41

OUTPut[:STATe] <*State*> RF Output

<State>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 |	Connector RF 1 used as output	RF2	–	
RF2 |	Connector RF 2 used as output			
RF3	Connector RF 3 OUT used as output			

Description of command	FW vers.
This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.	V2.41

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] <*Attenuation*> Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB |	External attenuation at input <nr>, (<nr> = 1, 2)	0.0	dB	
–90 dB to +90 dB	External attenuation at input <nr>, (<nr> = 4)	0.0	dB	

Description of command	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.	V2.41

[SENSe:]CORRection:LOSS:OUTput<nr>[:MAGNitude] <*Attenuation*>
SOURce:CORRection:LOSS:OUTput<nr>[:MAGNitude] <*Attenuation*> Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB |	External atten. at output <nr>, (<nr> = 1, 2)	0.0	dB	
–90 dB to +90 dB	External atten. at output <nr>, (<nr> = 3)	0.0	dB	

Description of command	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.	V2.41

Subsystem DM:CLOCk (Network Clock)

The subsystem *REFerence* sets a system clock frequency specific to the network. This frequency is set in the tab *Synch.* in the popup menu *Connect. Control*.

SOURce:DM:CLOCk:STATe <*Mode*>				REF OUT 2 on/off
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	
Description of command				FW vers.
This commands switches the system clock specific to the network at the *REF OUT 2* connector on or off.				V2.41

SOURce:DM:CLOCk:FREQuency <Frequency>				REF OUT 2
<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
7.80 MHz to 39.00 MHz	System clock frequency	13.0	MHz	
Description of command				FW vers.
This command determines the system clock frequency applied to *REF OUT 2*. The frequency entered is internally rounded to one of the following discrete values: 39.00 MHz, 19.50 MHz, 13.00 MHz, 9.75 MHz 7.80 MHz				V2.41

Measurement Groups (Non Signalling and Signalling)

The commands for the measurement groups in this section are identical in both test modes; they can be used in *Non Signalling* as well as in *Signalling* measurements.

Note:

In order to perform any kind of measurement and obtain a meaningful result, an appropriate test setup is required (see application examples in chapter 2 of this manual). Consequently, if the measurements reported in this section are performed in Signalling *mode, the* Call Established (CEST) *signalling state must be reached before most of the commands retrieving test results* (`READ...[:RESult]?`, `FETCh...[:RESult]?`, `SAMPle...[:RESult]?`, *or* `CALCulate...LIMit?`) *can be used. Test configurations, however, can be defined any time. The following exceptions apply:*

1. *The* `WPOWer` *measurement is available in all signalling states.*
2. *In the* `TXTests:MODulation` *subsystem (see section* Measured Values... *on p. 6.20), the* ST Frequency Error *and* ST Peak Deviation *measurement requires that the AMPS mobile transmits a signalling tone; the quantities can be obtained in the* Alerting (ALER) *state only. The remaining quantities are available in the* Call Established (CEST) *state.*

Test Object WPOWer (Wide Band Power)

The subsystem `WPOWer` contains the commands for measuring the power of the RF input signal using a wide-band filter. It corresponds to the softkey *Power* of the index card *Signalling* in the menu group *Connect. Control*.

Note:

In contrast to the measurement groups reported in the following sections, the `WPOWer` *measurement can be performed in all signalling states.*

INITiate:WPOWer	Start new measurement	*RUN*
ABORt:WPOWer	Abort running measurement and switch off	*OFF*
STOP:WPOWer	Stop measurement after current stat. cycle	*STOP*
CONTinue:WPOWer	Next measurement step (only *stepping mode*)	*RUN*
Description of command	Sig. State	FW vers.
These commands have no query form. They start or stop the measurement, setting it to the status given in the top right column.	all	V2.41[1]

---

[1] To use the commands of the WPOWer subsystem in function group *AMPS-MS Non Signalling*, a firmware verion ≥ V2.50 is required.

CONFigure:WPOWer:EREPorting <*Mode*> Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	Sig. State	FW vers.
This command defines the events generated when the measurement is terminated or stopped (*event reporting,* see chapter 5).	all	V2.41

FETCh:WPOWer:STATus? Measurement Status

Return	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	–
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	–

Description of command	Sig. State	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	all	V2.41

CONFigure:WPOWer:CONTrol:REPetition <*Repetition*>,<*StopCond*>,<*Stepmode*> Test cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)	SING	–	–
SINGleshot |	Single shot measurement (until `Status = RDY`)			
1 to 10000,	Multiple measurement (*counting*, until `Status = STEP | RDY`)			

<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror |	Start measurement in case of error *(stop on error)*	NONE	–	–
NONE,	Continue measurement even in case of error			

<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	–
NONE	Continue measurement according to its rep. mode			

Description of command	Sig. State	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always aborted after a single shot.*	all	V2.41

READ[:SCALar]:WPOWer[:RESult]?	Start single shot measurement and return results
FETCh[:SCALar]:WPOWer[:RESult]?	Read out measurement results (unsynchronized)
SAMPle[:SCALar]:WPOWer[:RESults]?	Read out measurement results (synchronized)

Return	Description of parameters	Def. value	Def. unit	Unit ring
–30.0 dBm to +30.0 dBm	Maximum power (not averaged)	NAN	dBm	

Description of command	Sig. State	FW vers.
These commands are always queries. They start the wide-band power and output the result.	all	V2.41

Test Object TXTests:MODulation

The subsystem *TXTests:MODulation* measures modulation parameters characterizing the mobile phone transmitter quality. The subsystem corresponds to the measurement menu *TX Tests,* application *Modulation,* and the associated popup menu *TX Tests Configuration.*

Control of Measurement – Subsystem TXTests:MODulation

The subsystem *TXTests:MODulation* controls the measurement. It corresponds to the softkey *MODulation* in the measurement menu *TX Tests*.

INITiate:TXTests:MODulation	Start new measurement	*RUN*
ABORt:TXTests:MODulation	Abort running measurement and switch off	*OFF*
STOP:TXTests:MODulation	Stop measurement after current stat. cycle	*STOP*
CONTinue:TXTests:MODulation	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.	V2.41

CONFigure:TXTests:MODulation:EREPorting *<Mode>* Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).	V2.41

FETCh:TXTests:MODulation:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	V2.41

Test Configuration

The commands of the following subsystems configure the *Modulation* measurement. They correspond to the sections in the *TX Tests Configuration* menu that are related to the *Modulation* application.

Subsystem TXTests:MODulation:CONTrol

The subsystem *TXTests:MODulation:CONTrol* configures the modulation measurement. It corresponds to the *Control* tab in the popup menu *TX Tests Config*.

CONFigure:TXTests:MODulation:CONTrol:REPetition <*Repetition*>, <*StopCond*>, <*Stepmode*> Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	V2.41

CONFigure:TXTests:MODulation:CONTrol:DEFault <*Enable*> Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Tolerance values – Subsystem TXTests:MODulation:LIMit

The subsystem *TXTests:MODulation:LIMit* defines tolerance values for the *Modulation* application of the *TX Tests* measurement. The subsystem corresponds to the relevant section in the *Limits* tab of the popup menu *TX Tests Configuration*.

CONFigure:TXTests:MODulation:LIMit Limits Modulation
<CarrFreqErrRange>, <TotPeakDevMax>, <SATFreqErrRge>, <SATPeakDevErrRge>, <STFreqErrRange>, <STPeakDevErrRge>, <ModDistNoise>, <ResAM>

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0 Hz to 48000 Hz,	Carrier Frequency Error Range,	2000	Hz	
0 Hz to 48000 Hz,	Total Peak Deviation Max,	14000	Hz	
0.0 Hz to 10000.0 Hz,	SAT Frequency Error Range,	1.0	Hz	
0 Hz to 48000 Hz,	SAT Peak Deviation Error Range,	200	Hz	
0.0 Hz to 10000.0 Hz,	ST Frequency Error Range,	1.0	Hz	
0 Hz to 48000 Hz,	ST Peak Deviation Error Range,	800	Hz	
0% to 100%,	Modulation Distortion and Noise,	5	%	
0% to 100%	Residual AM (amplitude modulation)	5	%	

Description of command	FW vers.
This command defines upper limits for the quantities measured in the *TX Tests – Modulation* application.	V2.41

CONFigure:TXTests:MODulation:LIMit:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Path Configuration – Subsystem TXTests:MODulation:FILTer

The subsystem *TXTests:MODulation:FILTer* configures the voice-processing equipment used in the *Modulation* application of the *TX Tests* measurement. The subsystem corresponds to the relevant section in the *Filters* tab of the popup menu *TX Tests Configuration.*

CONFigure:TXTests:MODulation:FILTer Path Configuration: TX Tests – Modulation
<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP10	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 20000 Hz			
BP17 |	6 Hz to 20000 Hz			
BP 18,	50 Hz to 20000 Hz			
<Deemphasis>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch de-emphasis on or off	ON	–	
<Expandor>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch expandor on or off	ON	–	
<Weighting>	Description of parameters	Def. value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	CME	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			
Description of command				FW vers.
This command defines the measuring equipment in the *TX Tests – Modulation* application.				V2.41

CONFigure:TXTests:MODulation:FILTer:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*				V2.41

Measured Values – Subsystem TXTests:MODulation[:RESult]

The subsystem *TXTests:MODulation[:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *TX Tests,* application *Modulation.*

READ[:SCALar]:TXTests:MODulation[:RESult]? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:TXTests:MODulation[:RESult]?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:TXTests:MODulation[:RESult]?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
Carrier Frequency Error,	–48 000 Hz to +48 000 Hz	NAN	Hz	
Total Peak Deviation,	0 Hz to +48 000 Hz	NAN	Hz	
SAT Frequency Error,	–6 000 Hz to +10 000 Hz	NAN	Hz	
SAT Peak Deviation,	0 Hz to +48 000 Hz	NAN	Hz	
ST Frequency Error[1],	–10 000 Hz to +10 000 Hz	NAN	Hz	
ST Peak Deviation,	0 Hz to +48 000 Hz	NAN	Hz	
Audio Peak Deviation	0 Hz to +48 000 Hz	NAN	Hz	
Audio RMS Deviation,	0 Hz to +48 000 Hz	NAN	Hz	
Mod. Distortion & Noise,	0% to 100%	NAN	%	
Carrier Power,	–90 dBm to +55 dBm	NAN	dBm	
Residual AM	0% to 100%	NAN	%	

Description of command	FW vers.
These commands are always queries. They start a *TX Tests – Modulation* measurement and output all measurement results (see chapter 4).	V2.41

CALCulate[:SCALar]:TXTests:MODulation[:RESult]:MATChing:LIMit? Results out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
Carrier Frequency Error,		INV	–	
Total Peak Deviation,		INV	–	
SAT Frequency Error,	**For all measured values:**	INV	–	
SAT Peak Deviation,		INV	–	
ST Frequency Error[1],		INV	–	
ST Peak Deviation,		INV	–	
Audio Peak Deviation	**NMAU |NMAL | INV | OK**	INV	–	
Audio RMS Deviation,		INV	–	
Mod. Distortion & Noise,		INV	–	
Residual AM		INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values (see above command) have been exceeded.	V2.41

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

---

[1] The *ST Frequency Error* and *ST Peak Deviation* measurement requires that the AMPS mobile transmits a signalling tone; the quantities can be obtained in the *Alerting (ALER)* state only. The remaining quantities are available in the *Call Established (CEST)* state.

Test Object TXTests:HNOise

The subsystem *TXTests:HNOise* measures the FM Hum & Noise of the mobile phone transmitter. The subsystem corresponds to the measurement menu *TX Tests,* application *Hum & Noise,* and the associated popup menu *TX Tests Configuration.*

Control of Measurement – Subsystem TXTests:HNOise

The subsystem *TXTests:HNOise* controls the measurement. It corresponds to the softkey *Hum & Noise* in the measurement menu *TX Tests.*

INITiate:TXTests:HNOise	Start new measurement	*RUN*
ABORt:TXTests:HNOise	Abort running measurement and switch off	*OFF*
STOP:TXTests:HNOise	Stop measurement after current stat. cycle	*STOP*
CONTinue:TXTests:HNOise	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.	V2.41

CONFigure:TXTests:HNOise:EREPorting *<Mode>* Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).	V2.41

FETCh:TXTests:HNOise:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	V2.41

Test Configuration

The commands of the following subsystems configure the *Hum & Noise* measurement. They correspond to the sections in the *TX Tests Configuration* menu that are related to the *Hum & Noise* application.

Subsystem TXTests:HNOise:CONTrol

The subsystem *TXTests:HNOise:CONTrol* configures the modulation measurement. It corresponds to the *Control* tab in the popup menu *TX Tests Config.*

CONFigure:TXTests:HNOise:CONTrol:REPetition *<Repetition>* ,*<StopCond>*,*<Stepmode>*				Test Cycles
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	
Description of command				FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*				V2.41

CONFigure:TXTests:HNOise:CONTrol:DEFault *<Enable>* Default Settings				
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.41

Tolerance values – Subsystem TXTests:HNOise:LIMit

The subsystem *TXTests:HNOise:LIMit* defines tolerance values for the *Hum & Noise* application of the *TX Tests* measurement. The subsystem corresponds to the relevant section in the *Limits* tab of the popup menu *TX Tests Configuration.*

CONFigure:TXTests:HNOise:LIMit
<CarrierFreqError>, <SATFreqError>,<SATPeakDev>,<Hum&Noise> Limits Hum & Noise

Parameters	Description of parameters	Def. value	Def. unit	Unit ring
CarrierFreqError	0 Hz to 48000 Hz	2000	Hz	
SATFreqError,	0 Hz to 10000 Hz	1.0	Hz	
SATPeakDeviation,	0 Hz to 48000 Hz	200	Hz	
Hum&Noise	FM Hum & Noise	32.0	dB	

Description of command	FW vers.
This command defines the upper limit for the *FM Hum & Noise*.	V2.41

CONFigure:TXTests:HNOise:LIMit:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Path Configuration – Subsystem TXTests:HNOise:FILTer

The subsystem *TXTests:HNOise:FILTer* configures the voice-processing equipment used in the *Hum & Noise* application of the *TX Tests* measurement. The subsystem corresponds to the relevant section in the *Filters* tab of the popup menu *TX Tests Configuration.*

CONFigure:TXTests:HNOise:FILTer Path Configuration: TX Tests – Modulation
<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP10	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 20000 Hz			
BP17 |	6 Hz to 20000 Hz			
BP 18,	50 Hz to 20000 Hz			

<Deemphasis>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch de-emphasis on or off	ON	–	

<Expandor>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch expandor on or off	ON	–	

<Weighting>	Description of parameters	Def. value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	CME	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			

Description of command	FW vers.
This command defines the measuring equipment in the *TX Tests – Hum & Noise* application.	V2.41

CONFigure:TXTests:HNOise:FILTer:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Measured Values – Subsystem TXTests:HNOise[:RESult]

The subsystem *TXTests:HNOise[:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *TX Tests,* application *Hum & Noise.*

				Scalar Results:
READ[:SCALar]:TXTests:HNOise[:RESult]?	Start single shot measurement and return results			
FETCh[:SCALar]:TXTests:HNOise[:RESult]?	Read out meas. results (unsynchronized)			
SAMPle[:SCALar]:TXTests:HNOise[:RESult]?	Read out measurement results (synchronized)			
Returned values	Value range	Def. value	Def. unit	Unit ring
CarrierFreqError	–48 000 Hz to +48 000 Hz	NAN	Hz	
SATFreqError,	–6 000 Hz to +10 000 Hz	NAN	Hz	
SATPeakDeviation,	0 Hz to +48 000 Hz	NAN	Hz	
Hum&Noise,	0 dB to 100 dB	NAN	dB	
CarrierPower	–90 dBm to +55 dBm	NAN	dBm	
Description of command				FW vers.
These commands are always queries. They start a *TX Tests – Hum & Noise* measurement and output all measurement results (see chapter 4).				V2.41

CALCulate[:SCALar]:TXTests:HNOise[:RESult]:MATChing:LIMit?	Results out of Tolerance			
Returned values	Value range	Def. value	Def. unit	Unit ring
CarrierFreqError	**For all measured values:**	INV	–	
SATFreqError,		INV	–	
SATPeakDeviation,	**NMAU | NMAL | INV | OK**	INV	–	
Hum&Noise		INV	–	
Description of command				FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values (see above command) have been exceeded. The following messages may be output for all measured values: NMAU Underflow of tolerance value *not matching, underflow* NMAL Tolerance value exceeded *not matching, overflow* INV Measurement invalid *invalid* OK all tolerances matched				V2.41

Test Object TXTests:AFLSearch

The subsystem *TXTests:AFLSearch* searches the AF Level of the mobile phone transmitter corresponding to a definite audio peak deviation. The subsystem corresponds to the measurement menu *TX Tests*, application *AF Level Search*, and the associated popup menu *TX Tests Configuration*.

Control of Measurement – Subsystem TXTests:AFLSearch

The subsystem *TXTests:AFLSearch* controls the measurement. It corresponds to the softkey *AF Level Search* in the measurement menu *TX Tests*.

INITiate:TXTests:AFLSearch	Start new measurement	*RUN*
ABORt:TXTests:AFLSearch	Abort running measurement and switch off	*OFF*
STOP:TXTests:AFLSearch	Stop measurement after current stat. cycle	*STOP*
CONTinue:TXTests:AFLSearch	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.		V2.41

CONFigure:TXTests:AFLSearch:EREPorting *<Mode>*				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting*, see chapter 5 of CMU manual).				V2.41

FETCh:TXTests:AFLSearch:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				V2.41

Test Configuration

The commands of the following subsystems configure the *AF Level Search* measurement. They correspond to the sections in the *TX Tests Configuration* menu that are related to the *AF Level Search* application.

Subsystem TXTests:AFLSearch:CONTrol

The subsystem *TXTests:AFLSearch:CONTrol* configures the modulation measurement. It corresponds to the *Control* tab in the popup menu *TX Tests Config.*

CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation <TargetDev> Target Audio Peak Deviation

<ErrRange>	Description of parameters	Def. value	Def. unit	Unit ring
0 Hz to 48000 Hz	Target audio peak deviation	8000	Hz	

Description of command	FW vers.
This command defines the target audio peak deviation for the *AF Level Search*.	V2.41

CONFigure:TXTests:AFLSearch:CONTrol:TDERange *<ErrRange>* Target Error Range

<ErrRange>	Description of parameters	Def. value	Def. unit	Unit ring
0 Hz to 48000 Hz	Target audio peak deviation error range	80	Hz	

Description of command	FW vers.
This command defines the target error range, i.e. a frequency interval centered around the target audio peak deviation (see previous command).	V2.41

CONFigure:TXTests:AFLSearch:CONTrol:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Tolerance values – Subsystem TXTests:AFLSearch:LIMit

The subsystem *TXTests:AFLSearch:LIMit* configures the *AF Level Search* iteration in the *TX Tests* measurement. The subsystem corresponds to the relevant section in the *Limits* tab of the popup menu *TX Tests Configuration.*

CONFigure:TXTests:AFLSearch:LIMit <*CarrierFrequencyError*> Limits AF Level Search

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0 Hz to 48000 Hz	Carrier Frequency Error	2000	Hz	

Description of command	FW vers.
This command defines an upper limit for the carrier frequency error.	V2.41

CONFigure:TXTests:AFLSearch:LIMit:DEFault <*Enable*> Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Path Configuration – Subsystem TXTests:AFLSearch:FILTer

The subsystem *TXTests:AFLSearch:FILTer* configures the voice-processing equipment used in the *AF Level Search* application of the *TX Tests* measurement. The subsystem corresponds to the relevant section in the *Filters* tab of the popup menu *TX Tests Configuration.*

CONFigure:TXTests:AFLSearch:FILTer Path Configuration: TX Tests – AFLSearch
<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP10	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 20000 Hz			
BP17 |	6 Hz to 20000 Hz			
BP 18,	50 Hz to 20000 Hz			
<Deemphasis>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch de-emphasis on or off	OFF	–	
<Expandor>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch expandor on or off	OFF	–	
<Weighting>	Description of parameters	Def. value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	OFF	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			

Description of command	FW vers.
This command defines the measuring equipment in the *TX Tests – AF Level Search* application.	V2.41

CONFigure:TXTests:AFLSearch:FILTer:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Measured Values – Subsystem TXTests:AFLSearch[:RESult]

The subsystem *TXTests:AFLSearch[:RESULT]* measures and returns the modulation parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *TX Tests*, application *AF Level Search*.

Scalar Results:

READ[:SCALar]:TXTests:AFLSearch[:RESult]? Start single shot measurement and return results

FETCh[:SCALar]:TXTests:AFLSearch[:RESult]? Read out meas. results (unsynchronized)

SAMPle[:SCALar]:TXTests:AFLSearch[:RESult]? Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
CarrierFreqError	–48 000 Hz to +48 000 Hz	NAN	Hz	
AudioPeakDeviation,	–6 000 Hz to +10 000 Hz	NAN	Hz	
AudioRMSDeviation,	0 Hz to +48 000 Hz	NAN	Hz	
CarrierPower,	0 dB to 100 dB	NAN	dBm	
AFSearchLevel	0 V to +5 V	NAN	V	

Description of command	FW vers.
These commands are always queries. They start a *TX Tests – AF Level Search* measurement and output all measurement results (see chapter 4).	V2.41

CALCulate[:SCALar]:TXTests:AFLSearch[:RESult]:MATChing? Results out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
CarrierFreqError	**For all measured values:**	INV	–	
AudioPeakDeviation,		INV	–	
AudioRMSDeviation	**NMAU |NMAL | INV | OK**	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values (see above command) have been exceeded. The following messages may be output for all measured values:	V2.41

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object TXAFresp

The subsystem *TXAFresp* measures the electrical audio frequency response of the mobile phone transmitter quality. The subsystem corresponds to the measurement menu *TX Audio Freq. Response* and the associated popup menu *TX Audio Freq. Response Configuration*.

Control of Measurement – Subsystem TXAFresp

The subsystem *TXAFresp* controls the measurement. It corresponds to the softkey *TX Audio Freq. Response* in the measurement menu *TX Audio Freq. Response*.

INITiate:TXAFresp	Start new measurement	*RUN*
ABORt:TXAFresp	Abort running measurement and switch off	*OFF*
STOP:TXAFresp	Stop measurement after current stat. cycle	*STOP*
CONTinue:TXAFresp	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.	V2.41

CONFigure:TXAFresp:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).	V2.41

FETCh:TXAFresp:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	V2.41

Test Configuration

The commands of the following subsystems configure the *TX Audio Freq. Response* measurement. They correspond to the *TX Audio Freq. Response Configuration* menu.

Subsystem TXAFresp:CONTrol

The subsystem *TXAFresp:CONTrol* configures the measurement. It corresponds to the *Control* tab in the popup menu *TX Audio Freq. Response Config* and the *Reference Deviation* hotkey.

CONFigure:TXAFresp:CONTrol:REPetition *<Repetition>*, *<StopCond>*, *<Stepmode>* Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous |	Continuous measurement (until `STOP` or `ABORT`)	SING	–	
SINGleshot |	Single shot measurement (until `Status = RDY`)			
1 to 10000	Multiple measurement (*counting*, until `Status = STEP | RDY`)			
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror |	Stop measurement in case of error *(stop on error)*	NONE	–	
NONE	Continue measurement even in case of error			
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP |	Interrupt measurement after each statistics cycle	NONE	–	
NONE	Continue measurement according to its rep. mode			

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	V2.41

DISPlay:TXAFresp:CONTrol:GRID *<Enable>* Grid on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	Switch on grid lines	ON	–	
OFF	Switch off grid lines			

Description of command	FW vers.
This command switches the grid lines in the test diagrams on or off.	V2.41

CONFigure:TXAFresp:CONTrol:RDEViation *<Deviation>* Reference Deviation

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
10.0 Hz to 20000.0 Hz	Reference deviation	1000.0	Hz	

Description of command	FW vers.
This command defines the reference frequency deviation (0 dB line of test diagram).	V2.41

CONFigure:TXAFresp:CONTrol:AFGLead <*Time*>				AF Generator Lead
<Time>	Description of parameters	Def. value	Def. unit	Unit ring
0 ms to 0.1 s	Holdoff time	0.014	s	
Description of command				FW vers.
This command defines a holdoff time for the AF generator.				V2.41

CONFigure:TXAFresp:CONTrol:RREQuest <*Reference*>				Default Settings
<Reference>	Description of parameters	Def. value	Def. unit	Unit ring
RDEV | **TON<nr>**	Results relative to the reference deviation Results relative to freq. response at test tone <nr>, where <nr> = 1 to 20	TON6	–	
Description of command				FW vers.
This command defines the reference value for the results of the *TX Audio Freq. Response* measurement. The reference deviation is defined via `CONFigure:TXAFresp:CONTrol:RDEViation`. To choose one of the test tones no. 1 to 20, it must be enabled via the `CONFigure:TXAFresp:TDEFinition:TONE<nr>` command.				V2.41

CONFigure:TXAFresp:CONTrol:DEFault <*Enable*>	Default Settings			
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.41

Subsystem TXAFresp:TRACe

The subsystem *TXAFresp:TRACe* defines the upper and lower edge of the test diagram. It corresponds to the *Scale Min.* and *Scale Max.* hotkeys in the measurement menu *TX Audio Freq. Response*.

DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe <*ScaleMin*>, <*ScaleMax*>				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
Arbitrary **Arbitrary**	Lower edge of test diagram Upper edge of test diagram	–10.0 +10.0	dB dB	
Description of command				FW vers.
This command defines the upper and lower edge of the test diagram. The values are relative to the reference deviation defined via `CONFigure:TXAFresp:CONTrol:RDEViation` (see p. 6.32).				V2.41

Subsystem SUBarrays:TXAFresp

The subsystem *SUBarrays:TXAFresp* defines the measurement range and the type of output values.

CONFigure:SUBarrays:TXAFresp <Mode>,<Start>,<Samples>{,<Start>,<Samples>}

Definition of Subarrays

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL |	Return all measurement values	ALL	–	
ARIThmetical |	Return arithm. mean value in every range			
MINimum |	Return minimum value in every range			
MAXimum,	Return maximum value in every range			
<Start>	**Description of parameters**	**Def. value**	**Def. unit**	**Unit ring**
1 to 20,	Start test tone in current range	1	–	
<Samples>	**Description of parameters**	**Def. value**	**Def. unit**	**Unit ring**
1 to 20	Number of test tones in current range	20	–	

Description of command	FW vers.
This command configures the `READ:SUBarrays:TXAFresp...`, `FETCh:SUBarrays:TXAFresp...`, and `SAMPle:SUBarrays:TXAFresp` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the <Samples> parameter) or a single statistical value is returned. The subranges are subsets of the full range of test tones defined via `CONFigure:TXAFresp:TONE<nr>`. Each subrange contains all test tones between the start test tone (test tone no. <Start>) and test tone no. <Start>+<Samples>–1. Test points inside this range that are disabled are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.	V2.41

Tolerance values – Subsystem TXAFresp:LIMit

The subsystem *TXAFresp:LIMit* defines tolerance values for the *TX Audio Freq. Response* measurement. The subsystem corresponds to the *Limits* tab of the popup menu *TX Audio Freq. Response Configuration.*

CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer
<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20> Upper Limit Line

<Limit_nr>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Upper limit line at tone <nr>	See below	dB	
<Enable_nr>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable upper limit line at tone <nr>	ON	–	

Description of command	FW vers.
This command configures the upper limit lines and enables the limit check at the 20 test tones that can be defined via `CONFigure:TXAFresp:TONE<nr>`.	V2.41

By default, the limit check is switched on at all tones and the following limit lines apply:

Tone <nr>	**Limit Line/[dB]**	**Enable**	**Tone <nr>**	**Limit Line/[dB]**	**Enable**
1	–9.5	ON	11	+5.6	ON
2	–6.2	ON	12	+6.3	ON
3	–3.8	ON	13	+6.9	ON
4	–1.9	ON	14	+7.5	ON
5	–0.3	ON	15	+8.0	ON
6	+1.0	ON	16	+8.6	ON
7	+2.1	ON	17	+9.1	ON
8	+3.1	ON	18	+9.6	ON
9	+4.0	ON	19	+10.0	ON
10	+4.8	ON	20	+10.5	ON

CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer:TONE<nr>
<Limit>, <Enable> Upper Limit

<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Upper limit line at tone <nr>	See below	dB	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable upper limit line at tone <nr>	ON	–	

Description of command	FW vers.
This command configures the upper limit and enables the limit check at one of 20 test tones that can be defined via `CONFigure:TXAFresp:TONE<nr>`. The test tones are numbered by <nr> = 1 to 20. The default limits at all test points are quoted in the previous command.	V2.41

CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer ***<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>*** Lower Limit Line

<Limit_nr>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Lower limit line at tone <nr>	See below	dB	
<Enable_nr>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable lower limit line at tone <nr>	ON	–	

Description of command	FW vers.
This command configures the lower limit lines and enables the limit check at the 20 test tones that can be defined via `CONFigure:TXAFresp:TONE<nr>`.	V2.41

By default, the limit check is switched on at all tones and the following limit lines apply:

Tone <nr>	Limit Line/[dB]	Enable	Tone <nr>	Limit Line/[dB]	Enable
1	–13.5	ON	11	+1.6	ON
2	–10.2	ON	12	+2.3	ON
3	–7.8	ON	13	+3.9	ON
4	–5.9	ON	14	+3.5	ON
5	–4.3	ON	15	+4.0	ON
6	–3.0	ON	16	+4.6	ON
7	–1.9	ON	17	+5.0	ON
8	–0.9	ON	18	+5.0	ON
9	0.0	ON	19	+5.0	ON
10	+0.8	ON	20	+5.0	ON

CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer:TONE<nr> ***<Limit>, <Enable>*** Upper Limit

<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Lower limit line at tone <nr>	See below	dB	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable lower limit line at tone <nr>	ON	–	

Description of command	FW vers.
This command configures the lower limit and enables the limit check at one of 20 test tones that can be defined via `CONFigure:TXAFresp:TONE<nr>`. The test tones are numbered by <nr> = 1 to 20. The default limits at all test points are quoted in the previous command.	V2.41

CONFigure:TXAFresp:LIMit[:LINE]:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Test Tones – Subsystem TXAFresp:TDEFinition

The subsystem *TXAFresp:TDEFinition* configures the audio test signal used for the *TX Audio Freq. Response* measurement. The subsystem corresponds to the *Freq./Lev.* tab of the popup menu *TX Audio Freq. Response Configuration.*

Note: *For firmware versions ≥ V2.44 (except V2.50, CDMA/AMPS), the* Freq./Lev. *tab of the* TX Audio Freq. Response Configuration *menu is replaced by the* Tone Def. *tab with an extended functionality concerning the level handling of each tone. To make use of the new features, it is recommended to rely upon the TXAFresp:AFGenerator subsystem (see p. 6.38 ff) instead of the TXAFresp:TDEFinition subsystem.*

The default configurations of the TXAFresp:TDEFinition subsystem and of its successor, the TXAFresp:AFGenerator subsystem, are identical.

CONFigure:TXAFresp:TDEFinition
<Freq_1>, <Lev_1>, <Enable_1>, ... <Freq_20>, <Lev_20>, <Enable_20> Test Tones

<Freq_nr>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15999 Hz,	Frequency of test tone <nr>	See below	Hz	
<Lev_nr>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 5.0 V,	Level at test tone <nr>	See below	V	
<Enable_nr>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on / off test tone <nr>	See below	–	

Description of command	FW vers.
This command enables and configures up to 20 test tones. Several tones may coincide; their frequencies must be in multiples of 1 Hz. The sum of all test tones must not exceed the maximum AF generator level quoted in the data sheet.	V2.41

The following default test tones are provided:

Tone <nr>	**Frequency/[Hz]**	**Level/[V]**	**Enable**	**Tone <nr>**	**Frequency/[Hz]**	**Level/[V]**	**Enable**
1	300	0.01	ON	11	1700	0.01	ON
2	440	0.01	ON	12	1840	0.01	ON
3	580	0.01	ON	13	1980	0.01	ON
4	720	0.01	ON	14	2120	0.01	ON
5	860	0.01	ON	15	2260	0.01	ON
6	1004	0.01	ON	16	2400	0.01	ON
7	1140	0.01	ON	17	2540	0.01	ON
8	1280	0.01	ON	18	2680	0.01	ON
9	1420	0.01	ON	19	2820	0.01	ON
10	1560	0.01	ON	20	3000	0.01	ON

CONFigure:TXAFresp:TDEFinition:TONE<nr> *<Frequency>*, *<Level>*, *<Enable>*				Freq./Level
<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15 999 Hz,	Frequency of test tone <nr>	See below	Hz	
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 5.0 V,	AF level test tone <nr>	See below	V	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on / off test tone <nr>	See below	–	
Description of command				FW vers.
This command enables and configures one of up to 20 test tones (<nr> = 1 to 20). The default values for all test tones are given in the previous command.				V2.41

CONFigure:TXAFresp:TDEFinition:DEFault *<Enable>*				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.41

Test Tones – Subsystem TXAFresp:AFGenerator

The subsystem *TXAFresp:AFGenerator* configures the audio test signal used for the *TX Audio Freq. Response* measurement. The subsystem corresponds to the *Tone Def.* tab of the popup menu *TX Audio Freq. Response Configuration.*

Note: *For firmware versions < V2.44 and for V2.50, CDMA/AMPS, the* Tone Def. *tab of the* TX Audio Freq. Response Configuration *menu is replaced by the* Freq./Lev. *tab with a restricted functionality concerning the level handling of each tone. The test tones must be defined by means of the TXAFresp:TDEFinition subsystem; see p. 6.37 f.*

The default configurations of the TXAFresp:TDEFinition subsystem and of its successor, the TXAFresp:AFGenerator subsystem, are identical.

CONFigure:TXAFresp:AFGenerator:ENABle*<Enable>* AF Gen. on/off				
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch on / off test tone no 1	ON	–	
…,				
ON | OFF	Switch on / off test tone no 20	ON	–	
Description of command				FW vers.
This command enables or disables all 20 test tones provided in the `TXAFresp` measurement.				V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:ENABle:TONE<nr> *<Enable>* AF Gen. on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on / off test tone <nr>	ON	–	

Description of command	FW vers.
This command enables or disables one of the 20 test tones provided in the `TXAFresp` measurement (<nr> = 1 to 20).	V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:FREQuency *<Frequency>* Test Tone Frequency

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15 999 Hz,	Frequency of test tone no. 1	See below	Hz	
...,	...			
10 Hz to 15 999 Hz	Frequency of test tone no. 20	See below	Hz	

Description of command	FW vers.
This command defines the frequency of the 20 test tones (<nr> = 1 to 20) provided in the `TXAFresp` measurement. All frequencies must be in multiples of 1 Hz, however, several tones may be at the same frequency. The following default test tones are provided:	V2.44 ≠V2.50

Tone <nr>	Frequency/[Hz]	Level/[V]	Enable	Tone <nr>	Frequency/[Hz]	Level/[V]	Enable
1	300	0.01	ON	11	1700	0.01	ON
2	440	0.01	ON	12	1840	0.01	ON
3	580	0.01	ON	13	1980	0.01	ON
4	720	0.01	ON	14	2120	0.01	ON
5	860	0.01	ON	15	2260	0.01	ON
6	1004	0.01	ON	16	2400	0.01	ON
7	1140	0.01	ON	17	2540	0.01	ON
8	1280	0.01	ON	18	2680	0.01	ON
9	1420	0.01	ON	19	2820	0.01	ON
10	1560	0.01	ON	20	3000	0.01	ON

CONFigure:TXAFresp:AFGenerator:FREQuency:TONE<nr> *<Frequency>*
Test Tone Frequency

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15 999 Hz	Frequency of test tone <nr>	See `CONFigure:TXAFresp:AFGenerator:FREQuency` *`<Frequency>`* command above	Hz	

Description of command	FW vers.
This command defines the frequency of one of the 20 test tones (<nr> = 1 to 20) provided in the `TXAFresp` measurement. All frequencies must be in multiples of 1 Hz, however, several tones may be at the same frequency.	V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:LEVel:LMODe *<Mode>* Level Selection

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
TLEV |	Use total level (manual)	TLEV	Hz	
SLEV |	Use separate levels for each tone			
SRES	Use AF Level Search result (as total level)			

Description of command	FW vers.
This command defines how the voltage of each of the test tones is determined. • In the default setting `TLEV`, the total AF generator level of 200 mV (see command `CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel`) is evenly distributed among all 20 enabled test tones. This is identical with the default configuration of the `TXAFresp:TDEFinition` subsystem; see p. 6.37 f. • To define test tone voltages that differ from each other, the parameter `SLEV` must be selected. • The `SRES` parameter is available only after an *AF Level Search*, see section *Test Object TXTests:AFLSearch* on page 6.26 ff. If an attempt is made to set the `SRES` parameter while no valid search results is available the CMU returns an SCPI error message "–221, Settings conflict".	V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel ***<Total_Level>*****Total Level (Manual)**

<Total_Level>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 5.0 V	Total level/voltage (sum of all test tones)	0.200	V	

Description of command	FW vers.
This command defines the total AF generator level that is evenly distributed among all enabled test tones. The total level setting comes into effect after the level selection mode is set to `TLEV` (see `CONFigure:TXAFresp:AFGenerator:LEVel:LMODe` command above). The total level must not exceed the maximum AF generator level quoted in the data sheet.	V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel ***<Separate_Levels>*****Separate Levels**

<Separate_Level>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 5.0 V,	Level/voltage of test tone no. 1	0.010	V	
...,	...			
0.0 V to 5.0 V	Level/voltage of test tone no. 20	0.010	V	

Description of command	FW vers.
This command defines separate AF generator levels for all 20 test tones provided in the `TXAFresp` measurement. The level settings come into effect after the level selection mode is set to `SLEV` (see `CONFigure:TXAFresp:AFGenerator:LEVel:LMODe` command above). The total level, i.e. the sum of the separate levels of all enabled test tones, must not exceed the maximum AF generator level quoted in the data sheet.	V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel:TONE<nr> ***<Separate_Level>*****Separate Level**

<Separate_Level>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 5.0 V	Level/voltage of test tone no. <nr>	0.010	V	

Description of command	FW vers.
This command defines separate AF generator levels for one of the 20 test tones (<nr> = 1 to 20) provided in the `TXAFresp` measurement. The level settings come into effect after the level selection mode is set to `SLEV` (see `CONFigure:TXAFresp:AFGenerator:LEVel:LMODe` command above). The total level, i.e. the sum of the separate levels of all enabled test tones, must not exceed the maximum AF generator level quoted in the data sheet.	V2.44 ≠V2.50

CONFigure:TXAFresp:AFGenerator:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.44 ≠V2.50

Path Configuration – Subsystem TXAFresp:FILTer

The subsystem *TXAFresp:FILTer* configures the voice-processing equipment used for the *TX Audio Freq. Response* measurement. The subsystem corresponds to the *Filters* tab of the popup menu *TX Audio Freq. Response Configuration.*

CONFigure:TXAFresp:FILTer Path Configuration: TX Audio Freq. Response
<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP16	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 20000 Hz			
BP17 |	6 Hz to 20000 Hz			
BP 18,	50 Hz to 20000 Hz			
<Deemphasis>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch de-emphasis on or off	OFF	–	
<Expandor>	Description of parameters	Def. Value	Def. unit	Unit ring
ON | OFF,	Switch expandor on or off	OFF	–	
<Weighting>	Description of parameters	Def. Value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	OFF	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			

Description of command	FW vers.
This command defines the measuring equipment in the *TX Audio Freq. Response* application.	V2.41

CONFigure:TXAFresp:FILTer:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Measured Values – Subsystem TXAFresp[:RESult]

The subsystem *TXAFresp[:RESULT]* measures and returns the electrical Audio Frequency Response and compares it with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *TX Audio Freq. Response*.

TX Audio Frequency Response, Single Point

READ[:SCALar]:TXAFresp[:RESult]:TONE<nr>? Start single shot measurement and return results *RUN*

FETCh[:SCALar]:TXAFresp[:RESult]:TONE<nr>? Read meas. results (unsynchronized) *RUN*

SAMPle[:SCALar]:TXAFresp[:RESult]:TONE<nr>? Read results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–150.0 dB to +150.0 dB	AF response at test tone <nr>	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the TX Audio Frequency Response at a single test tone defined via `CONFigure:TXAFresp:TONE<nr>` (<nr> = 1 to 20).	V2.41

TX Audio Frequency Response, Overall

READ:ARRay:TXAFresp[:RESult]? Start single shot measurement and return results *RUN*

FETCh:ARRay:TXAFresp[:RESult]? Read meas. results (unsynchronized) *RUN*

SAMPle:ARRay:TXAFresp[:RESult]? Read results (synchronized) *RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–150.0 dB to +150.0 dB,	FreqResp[1], 1st value for AF response	NAN	dB	
...	...	...	...	
–150.0 dB to +150.0 dB	FreqResp[20], 20th value for AF resp.	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the TX Audio Frequency Response at the 20 test tones defined via `CONFigure:TXAFresp:TONE<nr>`.	V2.41

Subarray Results

READ:SUBarrays:TXAFresp[:RESult]?	Start single shot measurement and return results	*RUN*
FETCh:SUBarrays:TXAFresp[:RESult]?	Read meas. results (unsynchronized)	*RUN*
SAMPle:SUBarrays:TXAFresp[:RESult]?	Read results (synchronized)	*RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
–150.0 dB to +150.0 dB	FreqResp[1], 1st value for AF response	NAN	dB	
...	...	...	...	
–150.0 dB to +150.0 dB	FreqResp[n], nth value for AF response	NAN	dB	

Description of command — FW vers. V2.41

These commands are always queries. They output the AF response in the subranges defined by means of the `CONFigure:SUBarrays:TXAFresp` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, and `SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, and `SAMPle:ARRay...` command group described above.

The `CONFigure:SUBarrays:TXAFresp` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned by subrange.

CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?

Limit Matching, Single Point

Returned result	Value range	Def. value	Def. unit	Unit ring
Limit matching at tone <nr>	**NMAU | NMAL | INV | OK**	INV	–	

Description of command — FW vers. V2.41

This command is always a query. It indicates whether and in which way the error limits at tone <nr> (<nr> = 1 to 20) have been exceeded.

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?

Limit Matching, Overall

Returned result	Value range	Def. value	Def. unit	Unit ring
20 bit field,	Indicator for upper limit matching in area 1 to 20,	NAN	–	
20 bit field	Indicator for lower limit matching in area 1 to 20	NAN	–	

Description of command — FW vers. V2.41

This command is always a query. Any set bit of the two returned fields indicates that the limits at the corresponding point are exceeded.

Test Object RXTests:AFANalyzer

The subsystem *RXTests:AFANalyzer* measures parameters characterizing the received audio signal from the mobile phone receiver. The subsystem corresponds to the measurement menu *RX Tests,* application *AF Analyzer,* and the associated popup menu *RX Tests Configuration.*

Control of Measurement – Subsystem RXTests:AFANalyzer

The subsystem *RXTests:AFANalyzer* controls the measurement. It corresponds to the softkey *AF Analyzer* in the measurement menu *RX Tests*.

INITiate:RXTests:AFANalyzer	Start new measurement	*RUN*
ABORt:RXTests:AFANalyzer	Abort running measurement and switch off	*OFF*
STOP:RXTests:AFANalyzer	Stop measurement after current stat. cycle	*STOP*
CONTinue:RXTests:AFANalyzer	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.		V2.41

CONFigure:RXTests:AFANalyzer:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).				V2.41

FETCh:RXTests:AFANalyzer:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate, CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				V2.41

Test Configuration

The commands of the following subsystems configure the *AF Analyzer* measurement. They correspond to the sections in the *RX Tests Configuration* menu that are related to the *AF Analyzer* application.

Subsystem RXTests:AFANalyzer:CONTrol

The subsystem *RXTests:AFANalyzer:CONTrol* configures the measurement. It corresponds to the *Control* tab in the popup menu *RX Tests Config*.

CONFigure:RXTests:AFANalyzer:CONTrol:REPetition *<Repetition>*, *<StopCond>*, *<Stepmode>* Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	V2.41

CONFigure:RXTests:AFANalyzer:CONTrol:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Tolerance values – Subsystem RXTests:AFANalyzer:LIMit

The subsystem *RXTests:AFANalyzer:LIMit* defines tolerance values for the *AF Analyzer* application of the *RX Tests* measurement. The subsystem corresponds to the relevant section in the *Limits* tab of the popup menu *RX Tests Configuration.*

CONFigure:RXTests:AFANalyzer:LIMit
<AFVoltMtrMin>, <AFVoltMtrMax>, <AFDist>, <AFSINAD> Limits AF Analyzer

Parameter	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 30.0 V | OFF | ON,	AF Voltmeter Minimum | limit check off | reactivate limit check	OFF	V	
0.0 V to 30.0 V | OFF | ON,	AF Voltmeter Maximum | limit check off | reactivate limit check	OFF	V	
0% to 100%,	AF Distortion (audio harmonic distortion)	5	%	
–99.0 dB to +100.0 dB	AF SINAD (0.1 dB steps)	+12.0	dB	

Description of command	FW vers.
This command defines upper limits for the quantities measured in the *RX Tests – AF Analyzer* application. The settings *ON* and *OFF* have a reverse effect; *OFF* is suitable for activating a limit check with limits that were previously defined but temporarily suspended.	V2.41

CONFigure:RXTests:AFANalyzer:LIMit:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Path Configuration – Subsystem RXTests:AFANalyzer:FILTer

The subsystem *RXTests:AFANalyzer:FILTer* configures the voice-processing equipment used in the *AF Analyzer* application of the *RX Tests* measurement. The subsystem corresponds to the relevant section in the *Filters* tab of the popup menu *RX Tests Configuration*.

CONFigure:RXTests:AFANalyzer:FILTer <*Bandpass*>, <*Weighting*>

Path Configuration: RX Tests – AF Analyzer

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP10	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 21000 Hz			
BP17 |	6 Hz to 21000 Hz			
BP 18,	50 Hz to 21000 Hz			

<Weighting>	Description of parameters	Def. value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	CME	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			

Description of command	FW vers.
This command defines the voice-processing equipment for the *RX Tests – AF Analyzer* application.	V2.41

CONFigure:RXTests:AFANalyzer:FILTer:DEFault <*Enable*>

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Measured Values – Subsystem RXTests:AFANalyzer[:RESult]

The subsystem *RXTests:AFANalyzer[:RESULT]* measures and returns the received audio signal parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *RX Tests*, application *AF Analyzer.*

READ[:SCALar]:RXTests:AFANalyzer[:RESult]? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:RXTests:AFANalyzer[:RESult]?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXTests:AFANalyzer[:RESult]?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	0 V to 30 V	NAN	V	
AFSINAD,	0 dB to 100 dB	NAN	dB	
AFDistortion,	0% to 100%	NAN	%	
Dist&SINADat	–	NAN	Hz	

Description of command	FW vers.
These commands are always queries. They start a *RX Tests – AF Analyzer* measurement and output all measurement results (see chapter 4).	V2.41

CALCulate[:SCALar]:RXTests:AFANalyzer[:RESult]:MATChing:LIMit?
Results out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	**For all measured values:**	INV	–	
AFSINAD,		INV	–	
AFDistortion	**NMAU |NMAL | INV | OK**	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values (see above command) have been exceeded. The following messages may be output for all measured values:	V2.41

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object RXTests:AFANalyzer:VMSinad (Fast SINAD Measurement)

The subsystem *RXTests:AFANalyzer:VMSinad* measures the audio voltage and the SINAD of the audio signal from the mobile phone receiver, omitting the (more time-consuming) AF distortion measurement. It represents a simplified version of the *RXTests:AFANalyzer* measurement (see p. 6.44 ff), optimized for fast SINAD tests. The limit values and filter settings are taken from the *RXTests:AFANalyzer* subsystem (see p. 6.46 ff). The *RXTests:AFANalyzer:VMSinad* subsystem has no equivalent in manual control.

Control of Measurement – Subsystem RXTests:AFANalyzer:VMSinad

The subsystem *RXTests:AFANalyzer:VMSinad* controls the fast SINAD measurement.

INITiate:RXTests:AFANalyzer:VMSinad	Start new measurement	*RUN*
ABORt:RXTests:AFANalyzer:VMSinad	Abort running measurement and switch off	*OFF*
STOP:RXTests:AFANalyzer:VMSinad	Stop measurement after current stat. cycle	*STOP*
CONTinue:RXTests:AFANalyzer:VMSinad	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.		V2.44

CONFigure:RXTests:AFANalyzer:VMSinad:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	–
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).				V2.44

FETCh:RXTests:AFANalyzer:VMSinad:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate`, `CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	
1 to 10000 | **NONE**	Counter for current statistics cycle No counting mode set	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				V2.44

Test Configuration

The commands of the following subsystems configure the fast SINAD measurement.

Subsystem RXTests:AFANalyzer:VMSinad:CONTrol

The subsystem *RXTests:AFANalyzer:VMSinad:CONTrol* configures the measurement.

CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:REPetition ***<Repetition>, <StopCond>, <Stepmode>*** Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	V2.44

CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:MTIMe ***<MeasTime>*** Default Settings

<MeasTime>	Description of parameters	Def. value	Def. unit	Unit ring
0.025 s to 1 s	Measurement time	0.3	s	

Description of command	FW vers.
This command defines the time after which the result of the fast SINAD measurement is regarded as valid and returned.	V2.44

CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:DEFault ***<Enable>*** Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.44

Measured Values – Subsystem RXTests:AFANalyzer:VMSinad[:RESult]

The subsystem *RXTests:AFANalyzer:VMSinad[:RESULT]* measures and returns the received audio signal parameters and compares them with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *RX Tests,* application *AF Analyzer.*

READ[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]? Scalar Results:
Start single shot measurement and return results

FETCh[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?
Read out meas. results (unsynchronized)

SAMPle[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	0 V to 30 V	NAN	V	
AFSINAD,	0 dB to 100 dB	NAN	dB	
SINADat	–	NAN	Hz	

Description of command	FW vers.
These commands are always queries. They start a *RX Tests – AF Analyzer* measurement and output all measurement results (see chapter 4).	V2.44

CALCulate[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]:MATChing:LIMit?
Bursts out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	**For all measured values:**	INV	–	
AFSINAD	**NMAU |NMAL | INV | OK**	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values have been exceeded. The limits are defined in the `RXTests:AFANalyzer` subsystem (see p. 6.46 ff).	V2.44

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object RXTests:HNOise

The subsystem *RXTests:HNOise* measures the FM Hum & Noise of the mobile phone receiver. The subsystem corresponds to the measurement menu *RX Tests,* application *Hum & Noise,* and the associated popup menu *RX Tests Configuration.*

Control of Measurement – Subsystem RXTests:HNOise

The subsystem *RXTests:HNOise* controls the measurement. It corresponds to the softkey *Hum & Noise* in the measurement menu *RX Tests*.

INITiate:RXTests:HNOise	Start new measurement	*RUN*
ABORt:RXTests:HNOise	Abort running measurement and switch off	*OFF*
STOP:RXTests:HNOise	Stop measurement after current stat. cycle	*STOP*
CONTinue:RXTests:HNOise	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.		V2.41

CONFigure:RXTests:HNOise:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ | **SOPC |** **SRSQ |** **OFF**	Service request Single operation complete SRQ and SOPC No reporting	OFF	–	–
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).				V2.41

FETCh:RXTests:HNOise:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **STOP |** **ERR |** **STEP |** **RDY,**	Measurement in the *OFF* state (`*RST` or `ABORt`) Running (after `INITiate`, `CONTinue` or `READ`) Stopped (`STOP`) *OFF* (could not be started) Stepping mode *(<stepmode>=STEP)* Stopped according to repetition mode and stop condition	OFF	–	
1 to 10000 | **NONE**	Counter for current statistics cycle No counting mode set	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				V2.41

Test Configuration

The commands of the following subsystems configure the *Hum & Noise* measurement. They correspond to the sections in the *RX Tests Configuration* menu that are related to the *Hum & Noise* application.

Subsystem RXTests:HNOise:CONTrol

The subsystem *RXTests:HNOise:CONTrol* configures the measurement. It corresponds to the *Control* tab in the popup menu *RX Tests Config*.

CONFigure:RXTests:HNOise:CONTrol:REPetition *<Repetition>* ,*<StopCond>*,*<Stepmode>*

Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command	FW vers.
This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement. **Note:** *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*	V2.41

CONFigure:RXTests:HNOise:CONTrol:DEFault *<Enable>*

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Tolerance values – Subsystem RXTests:HNOise:LIMit

The subsystem *RXTests:HNOise:LIMit* defines tolerance values for the *Hum & Noise* application of the *RX Tests* measurement. The subsystem corresponds to the relevant section in the *Limits* tab of the popup menu *RX Tests Configuration.*

CONFigure:RXTests:HNOise:LIMit *<AFVoltmMin>,<AFVoltmMax>,<Hum&Noise>*
Limits Hum & Noise

<Hum&Noise>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 30.0 V | OFF | ON,	AF Voltmeter Minimum | limit check off | reactivate limit check	OFF	V	
0.0 V to 30.0 V | OFF | ON,	AF Voltmeter Maximum | limit check off | reactivate limit check	OFF	V	
0.0 dB to 100.0 dB	FM Hum & Noise	32.0	dB	

Description of command	FW vers.
This command defines the upper limit for the *FM Hum & Noise*. The settings *ON* and *OFF* have a reverse effect; *OFF* is suitable for activating a limit check with limits that were previously defined but temporarily suspended.	V2.41

CONFigure:RXTests:HNOise:LIMit:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Path Configuration – Subsystem RXTests:HNOise:FILTer

The subsystem *RXTests:HNOise:FILTer* configures the voice-processing equipment used in the *Hum & Noise* application of the *RX Tests* measurement. The subsystem corresponds to the relevant section in the *Filters* tab of the popup menu *RX Tests Configuration.*

CONFigure:RXTests:HNOise:FILTer *<Bandpass>, <Weighting>*

Path Configuration: RX Tests – AF Analyzer

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP10	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 21000 Hz			
BP17 |	6 Hz to 21000 Hz			
BP 18,	50 Hz to 21000 Hz			
<Weighting>	**Description of parameters**	**Def. value**	**Def. unit**	**Unit ring**
CME |	Switch on C-message weighted filter	CME	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			

Description of command	FW vers.
This command defines the measuring equipment in the *RX Tests – Hum & Noise* application.	V2.41

CONFigure:RXTests:HNOise:FILTer:DEFault *<Enable>*

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Measured Values – Subsystem RXTests:HNOise[:RESult]

The subsystem *RXTests:HNOise[:RESULT]* measures and returns the hum & noise and compares it with the tolerance values. The subsystem corresponds to the output elements in the measurement menu *RX Tests,* application *Hum & Noise*.

READ[:SCALar]:RXTests:HNOise[:RESult]?	Scalar Results: Start single shot measurement and return results
FETCh[:SCALar]:RXTests:HNOise[:RESult]?	Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXTests:HNOise[:RESult]?	Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	0 V to 30 V	NAN	V	
Hum&Noise	0 dB to 100 dB	NAN	dB	

Description of command	FW vers.
These commands are always queries. They start a *RX Tests – Hum & Noise* measurement and output all measurement results (see chapter 4).	V2.41

CALCulate[:SCALar]:RXTests:HNOise[:RESult]:MATChing:LIMit?	Results out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	**For all measured values:**	INV	–	
Hum&Noise	**NMAU |NMAL | INV | OK**	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values (see above command) have been exceeded.	V2.41

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object RXTests:SENSitivity

The subsystem *RXTests:SENSitivity* searches the sensitivity level of the mobile phone receiver. The subsystem corresponds to the measurement menu *RX Tests,* application *Sensitivity,* and the associated popup menu *RX Tests Configuration*.

Control of Measurement – Subsystem RXTests:SENSitivity

The subsystem *RXTests:SENSitivity* controls the measurement. It corresponds to the softkey *Sensitivity* in the measurement menu *RX Tests*.

INITiate:RXTests:SENSitivity	Start new measurement	*RUN*
ABORt:RXTests:SENSitivity	Abort running measurement and switch off	*OFF*
STOP:RXTests:SENSitivity	Stop measurement after current stat. cycle	*STOP*
CONTinue:RXTests:SENSitivity	Next measurement step (only *stepping mode*)	*RUN*

Description of command	FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.	V2.41

CONFigure:RXTests:SENSitivity:EREPorting *<Mode>* Event Reporting

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			

Description of command	FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).	V2.41

FETCh:RXTests:SENSitivity:STATus? Measurement Status

Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	

Description of command	FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).	V2.41

Test Configuration

The commands of the following subsystems configure the *Sensitivity* measurement. They correspond to the sections in the *RX Tests Configuration* menu that are related to the *Sensitivity* application.

Subsystem RXTests:SENSitivity:CONTrol

The subsystem *RXTests:SENSitivity:CONTrol* configures the measurement. It corresponds to the *Control* tab in the popup menu *RX Tests Config*.

CONFigure:RXTests:SENSitivity:CONTrol:TSINad <*Target*>				Target SINAD
<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
–99 dB to + 200 dB	Target SINAD	+12	dB	
Description of command				FW vers.
This command determines the target SINAD for the *RX Sensitivity* iteration.				V2.41

CONFigure:RXTests:SENSitivity:CONTrol:TSERange <*Range*>				Tgt. SINAD Err. Range
<Range>	Description of parameters	Def. value	Def. unit	Unit ring
0.0 dB to 100.0 dB	Target SINAD error range	0.5	dB	
Description of command				FW vers.
This command determines the target SINAD error range providing the stop criterion for the sensitivity iteration.				V2.41

CONFigure:RXTests:SENSitivity:CONTrol:DEFault <*Enable*>				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.41

Tolerance values – Subsystem RXTests:SENSitivity:LIMit

The subsystem *RXTests:SENSitivity:LIMit* configures the *Sensitivity* iteration in the *RX Tests* measurement. The subsystem corresponds to the relevant section in the *Limits* tab of the popup menu *RX Tests Configuration.*

CONFigure:RXTests:SENSitivity:LIMit *<AFVolmMin>, <AFVoltmMax>, <Sensitivity>*

AF Voltmeter, Sensitivity Limit

Parameters	Description of parameters	Def. value	Def. unit	Unit ring
0.0 V to 30.0 V | OFF | ON,	AF Voltmeter Minimum | limit check off | reactivate limit check	OFF	V	
0.0 V to 30.0 V | OFF | ON,	AF Voltmeter Maximum | limit check off | reactivate limit check	OFF	V	
–150 dBm to 0 dBm	Sensitivity limit	–116	dBm	

Description of command	FW vers.
This command defines the input voltage range for the AF analyzer and the upper limit of the sensitivity level. The settings *ON* and *OFF* have a reverse effect; *OFF* is suitable for activating a limit check with limits that were previously defined but temporarily suspended.	V2.41

CONFigure:RXTests:SENSitivity:LIMit:DEFault *<Enable>*

Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Path Configuration – Subsystem RXTests:SENSitivity:FILTer

The subsystem *RXTests:SENSitivity:FILTer* configures the voice-processing equipment used in the *Sensitivity* application of the *RX Tests* measurement. The subsystem corresponds to the relevant section in the *Filters* tab of the popup menu *RX Tests Configuration.*

CONFigure:RXTests:SENSitivity:FILTer *<Bandpass>, <Weighting>*

Path Configuration: RX Tests – AF Analyzer

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP10	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 21000 Hz			
BP17 |	6 Hz to 21000 Hz			
BP 18,	50 Hz to 21000 Hz			
<Weighting>	Description of parameters	Def. value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	CME	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			

Description of command	FW vers.
This command defines the measuring equipment in the *RX Tests – Sensitivity* application.	V2.41

CONFigure:RXTests:SENSitivity:FILTer:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF).*	V2.41

Measured Values – Subsystem RXTests:SENSitivity[:RESult]

The subsystem *RXTests:SENSitivity[:RESULT]* measures and returns the sensitivity and compares it with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *RX Tests,* application *Sensitivity.*

READ[:SCALar]:RXTests:SENSitivity[:RESult]? Scalar Results:
Start single shot measurement and return results
FETCh[:SCALar]:RXTests:SENSitivity[:RESult]?
Read out meas. results (unsynchronized)
SAMPle[:SCALar]:RXTests:SENSitivity[:RESult]?
Read out measurement results (synchronized)

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	0 V to 30 V	NAN	V	
AFSINAD,	0 dB to 100 dB	NAN	dB	
Sensitivity,	–150.0 dBm to 13 dBm	NAN	dBm	
SINADat	100 Hz to 10 000 Hz	NAN	Hz	

Description of command	FW vers.
These commands are always queries. They start a *RX Tests – Sensitivity* measurement and output all measurement results (see chapter 4).	V2.41

CALCulate[:SCALar]:RXTests:SENSitivity[:RESult]:MATChing:LIMit? Results out of Tolerance

Returned values	Value range	Def. value	Def. unit	Unit ring
AFVoltmeter,	**For all measured values:**	INV	–	
AFSINAD,		INV	–	
Sensitivity	**NMAU | MAL | INV | OK**	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits for the measured values (see above command) have been exceeded.	V2.41

The following messages may be output for all measured values:

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

Test Object RXAFresp

The subsystem *RXAFresp* measures the electrical audio frequency response of the mobile phone receiver quality. The subsystem corresponds to the measurement menu *RX Audio Freq. Response* and the associated popup menu *RX Audio Freq. Response Configuration.*

Control of Measurement – Subsystem RXAFresp

The subsystem *RXAFresp* controls the measurement. It corresponds to the softkey *RX Audio Freq. Response* in the measurement menu *RX Audio Freq. Response*.

INITiate:RXAFresp	Start new measurement	*RUN*
ABORt:RXAFresp	Abort running measurement and switch off	*OFF*
STOP:RXAFresp	Stop measurement after current stat. cycle	*STOP*
CONTinue:RXAFresp	Next measurement step (only *stepping mode*)	*RUN*
Description of command		FW vers.
These commands have no query form. They start and stop the measurement, setting it to the status indicated in the top right column.		V2.41

CONFigure:RXAFresp:EREPorting <*Mode*>				Event Reporting
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
SRQ |	Service request	OFF	–	–
SOPC |	Single operation complete			
SRSQ |	SRQ and SOPC			
OFF	No reporting			
Description of command				FW vers.
This command defines the events generated when the measurement is terminated or stopped *(event reporting,* see chapter 5 of CMU manual).				V2.41

FETCh:RXAFresp:STATus?				Measurement Status
Ret. values	Description of parameters	Def. value	Def. unit	Unit ring
OFF |	Measurement in the *OFF* state (`*RST` or `ABORt`)	OFF	–	
RUN |	Running (after `INITiate`, `CONTinue` or `READ`)			
STOP |	Stopped (`STOP`)			
ERR |	*OFF* (could not be started)			
STEP |	Stepping mode *(<stepmode>=STEP)*			
RDY,	Stopped according to repetition mode and stop condition			
1 to 10000 |	Counter for current statistics cycle			
NONE	No counting mode set	NONE	–	
Description of command				FW vers.
This command is always a query. It returns the status of the measurement (see chapters 3 and 5).				V2.41

Test Configuration

The commands of the following subsystems configure the *RX Audio Freq. Response* measurement. They correspond to the *RX Audio Freq. Response Configuration* menu.

Subsystem RXAFresp:CONTrol

The subsystem *RXAFresp:CONTrol* configures the measurement. It corresponds to the *Control* tab in the popup menu *RX Audio Freq. Response Config* and the *Reference Deviation* hotkey.

CONFigure:RXAFresp:CONTrol:REPetition *<Repetition>*, *<StopCond>*, *<Stepmode>* Test Cycles

<Repetition>	Description of parameters	Def. value	Def. unit	Unit ring
CONTinuous | **SINGleshot |** **1 to 10000,**	Continuous measurement (until `STOP` or `ABORT`) Single shot measurement (until `Status = RDY`) Multiple measurement (*counting*, until `Status = STEP | RDY`)	SING	–	
<StopCond>	Description of parameters	Def. value	Def. unit	Unit ring
SONerror | **NONE,**	Stop measurement in case of error *(stop on error)* Continue measurement even in case of error	NONE	–	
<Stepmode>	Description of parameters	Def. value	Def. unit	Unit ring
STEP | **NONE**	Interrupt measurement after each statistics cycle Continue measurement according to its rep. mode	NONE	–	

Description of command — FW vers.: V2.41

This command determines the number of statistics cycles, the stop condition and the stepping mode for the measurement.

Note: *In the case of READ commands (`READ:...`), the <Repetition> parameter has no effect; the measurement is always stopped after a single shot.*

DISPlay:RXAFresp:CONTrol:GRID *<Enable>* Grid on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	Switch on grid lines Switch off grid lines	ON	–	

Description of command — FW vers.: V2.41

This command switches the grid lines in the test diagrams on or off.

CONFigure:RXAFresp:CONTrol:RLEVel *<Voltage>* Reference Level

<Voltage>	Description of parameters	Def. value	Def. unit	Unit ring
0.001 V to 5.000 V	Reference Level	0.010	V	

Description of command — FW vers.: V2.41

This command defines the reference level for the electrical audio frequency response.

CONFigure:RXAFresp:CONTrol:RREQuest <*Reference*>				Result
<Reference>	Description of parameters	Def. value	Def. unit	Unit ring
RLEV | **TON<nr>**	Results relative to the reference level Results relative to freq. response at test tone <nr>, where <nr> = 1 to 20	TON4	–	

Description of command	FW vers.
This command defines the reference value for the results of the *RX Audio Freq. Response* measurement. The reference level is defined via `CONFigure:RXAFresp:CONTrol:LEVel`. To choose one of the test tones no. 1 to 20, it must be enabled via the `CONFigure:RXAFresp:TONE<nr>` command.	V2.41

CONFigure:RXAFresp:CONTrol:AFGLead <*Time*>				AF Generator Lead
<Time>	Description of parameters	Def. value	Def. unit	Unit ring
0 s to 0.1 s	Holdoff time	0.014	s	

Description of command	FW vers.
This command defines a holdoff time for the AF generator.	V2.41

CONFigure:RXAFresp:CONTrol:DEFault <*Enable*>	Default Settings			
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Subsystem RXAFresp:TRACe

The subsystem *RXAFresp:TRACe* defines the upper and lower edge of the test diagram. It corresponds to the *Scale Min.* and *Scale Max.* hotkeys in the measurement menu *RX Audio Freq. Response*.

DISPlay:RXAFresp[:WINDow]:TRACe:Y:SCALe <*ScaleMin*>, <*ScaleMax*>				Grid on/off
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
Arbitrary **Arbitrary**	Upper edge of test diagram Lower edge of test diagram	–10.0 +10.0	dB dB	

Description of command	FW vers.
This command defines the upper and lower edge of the test diagram. The values are relative to the reference level defined via `CONFigure:RXAFresp:CONTrol:RLEVel` (see p. 6.63).	V2.41

Subsystem SUBarrays:RXAFresp

The subsystem *SUBarrays:RXAFresp* defines the measurement range and the type of output values.

CONFigure:SUBarrays:RXAFresp Definition of Subarrays
<Mode>,<Start>,<Samples>{,<Start>,<Samples>}

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ALL | **ARIThmetical |** **MINimum |** **MAXimum,**	Return all measurement values Return arithm. mean value in every range Return minimum value in every range Return maximum value in every range	ALL	–	
<Start>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 20,	Start test tone in current range	1	–	
<Samples>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 20	Number of test tones in current range	20	–	

Description of command	FW vers.
This command configures the `READ:SUBarrays:RXAFresp...`, `FETCh:SUBarrays:RXAFresp...`, and `SAMPle:SUBarrays:RXAFresp` commands. It restricts the measurement to up to 32 subranges where either all measurement results (the number of which is given by the <Samples> parameter) or a single statistical value is returned. The subranges are subsets of the full range of test tones defined via `CONFigure:RXAFresp:TONE<nr>`. Each subrange contains all test tones between the start test tone (test tone no. <Start>) and test tone no. <Start>+<Samples>–1. Test points inside this range that are disabled are not measured (result *NAN)* and do not enter into the ARIThmetical, MINimum and MAXimum values. By default, only one range corresponding to the total measurement range is used and all measurement values are returned.	V2.41

Tolerance values – Subsystem RXAFresp:LIMit

The subsystem *RXAFresp:LIMit* defines tolerance values for the *RX Audio Freq. Response* measurement. The subsystem corresponds to the *Limits* tab of the popup menu *RX Audio Freq. Response Configuration.*

CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer
<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20> Upper Limit, Overall

<Limit_nr>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Upper limit line at tone <nr>	See below	dB	
<Enable_nr>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable upper limit line at tone <nr>	ON	–	

Description of command	FW vers.
This command configures the upper limit lines and enables the limit check at the 20 test tones that can be defined via `CONFigure:RXAFresp:TONE<nr>`.	V2.41

By default, the limit check is switched on at all tones and the following limit lines apply:

Tone <nr>	Limit Line/[dB]	Enable	Tone <nr>	Limit Line/[dB]	Enable
1	13.4	ON	11	–8.8	ON
2	+7.1	ON	12	–9.6	ON
3	+3.5	ON	13	–10.3	ON
4	+1.0	ON	14	–13.3	ON
5	–1.2	ON	15	–17.0	ON
6	–3.0	ON	16	–20.6	ON
7	–4.5	ON	17	–24.4	ON
8	–5.8	ON	18	–27.9	ON
9	–6.9	ON	19	–31.3	ON
10	–7.9	ON	20	–34.4	ON

CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer:TONE<nr>
<Limit>, <Enable> Upper Limit, Single Point

<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Upper limit line at tone <nr>	See below	dB	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable upper limit line at tone <nr>	ON	–	

Description of command	FW vers.
This command configures the upper limit and enables the limit check at one of 20 test tones that can be defined via `CONFigure:RXAFresp:TONE<nr>`. The test tones are numbered by <nr> = 1 to 20. The default limits at all test points are quoted in the previous command.	V2.41

CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer
<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20> Lower Limits, Overall

<Limit_nr>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Lower limit line at tone <nr>	See below	dB	
<Enable_nr>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable lower limit line at tone <nr>	ON	–	

Description of command — FW vers.: V2.41

This command configures the lower limit lines and enables the limit check at the 20 test tones that can be defined via `CONFigure:RXAFresp:TONE<nr>`.

By default, the limit check is switched on at all tones and the following limit lines apply:

Tone <nr>	Limit Line/[dB]	Enable	Tone <nr>	Limit Line/[dB]	Enable
1	–80.0	ON	11	–15.8	ON
2	+3.1	ON	12	–16.6	ON
3	–0.5	ON	13	–17.3	ON
4	–3.0	ON	14	–80.0	ON
5	–5.2	ON	15	–80.0	ON
6	–7.0	ON	16	–80.0	ON
7	–8.5	ON	17	–80.0	ON
8	–9.8	ON	18	–80.0	ON
9	–13.9	ON	19	–80.0	ON
10	–14.9	ON	20	–80.0	ON

CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer:TONE<nr>
<Limit>, <Enable> Lower Limit, Single Point

<Limit>	Description of parameters	Def. value	Def. unit	Unit ring
–80 dB to +80 dB,	Lower limit line at tone <nr>	See below	dB	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Enable lower limit line at tone <nr>	ON	–	

Description of command — FW vers.: V2.41

This command configures the lower limit and enables the limit check at one of 20 test tones that can be defined via `CONFigure:RXAFresp:TONE<nr>`. The test tones are numbered by <nr> = 1 to 20. The default limits at all test points are quoted in the previous command.

CONFigure:RXAFresp:LIMit[:LINE]:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	

Description of command — FW vers.: V2.41

If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message).

If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.

Test Tones – Subsystem RXAFresp:TDEFinition

The subsystem *RXAFresp:TDEFinition* configures the audio test signal used for the *RX Audio Freq. Response* measurement. The subsystem corresponds to the *Freq./Dev.* tab of the popup menu *RX Audio Freq. Response Configuration.*

Note: *For firmware versions ≥ V2.44 (except V2.50, CDMA/AMPS), the* Freq./Lev. *tab of the* RX Audio Freq. Response Configuration *menu is replaced by the* Tone Def. *tab with an extended functionality concerning the frequency deviation handling of each tone. To make use of the new features, it is recommended to rely upon the RXAFresp:MODGenerator subsystem (see p. 6.69 ff) instead of the RXAFresp:TDEFinition subsystem.*

The default configurations of the RXAFresp:TDEFinition subsystem and of its successor, the RXAFresp:MODGenerator subsystem, are identical.

CONFigure:RXAFresp:TDEFinition
<Freq_1>, <Dev_1>, <Enable_1>, ... <Freq_20>, <Dev_20>, <Enable_20> Test Tones

<Freq_nr>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15999 Hz,	Frequency of test tone <nr>	See below	Hz	
<Dev_nr>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 20000 Hz,	Frequency deviation at test tone <nr>	See below	Hz	
<Enable_nr>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on / off test tone <nr>	See below	–	

Description of command	FW vers.
This command enables and configures up to 20 test tones. The minimum frequency spacing between two tones is 1 Hz. The sum of all test tones must not exceed the maximum AF generator level quoted in the data sheet.	V2.41

The following default test tones are provided:

Tone <nr>	Frequency/[Hz]	Dev./[Hz]	Enable	Tone <nr>	Frequency/[Hz]	Dev./[Hz]	Enable
1	240	145.0	ON	11	3100	145.0	ON
2	500	145.0	ON	12	3400	145.0	ON
3	750	145.0	ON	13	3700	145.0	ON
4	1004	145.0	ON	14	4000	145.0	ON
5	1300	145.0	ON	15	4300	145.0	ON
6	1600	145.0	ON	16	4600	145.0	ON
7	1900	145.0	ON	17	4950	145.0	ON
8	2200	145.0	ON	18	5300	145.0	ON
9	2500	145.0	ON	19	5650	145.0	ON
10	2800	145.0	ON	20	6000	145.0	ON

CONFigure:RXAFresp:TDEFinition:TONE<nr> *<Frequency>, <Deviation>, <Enable>* Test Tones

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15999 Hz,	Frequency of test tone <nr>	See below	Hz	
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 20000 Hz,	Frequency deviation test tone <nr>	See below	Hz	
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on / off test tone <nr>	See below	–	

Description of command	FW vers.
This command enables and configures one of up to 20 test tones (<nr> = 1 to 20). The default values for all test tones are given in the previous command.	V2.41

CONFigure:RXAFresp:TDEFinition:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.41

Test Tones – Subsystem RXAFresp:MODGenerator

The subsystem *RXAFresp:MODGenerator* configures the audio test signal used for the *RX Audio Freq. Response* measurement. The subsystem corresponds to the *Tone Def.* tab of the popup menu *RX Audio Freq. Response Configuration.*

Note: *For firmware versions < V2.44 and for V2.50, CDMA/AMPS, the* Tone Def. *tab of the* RX Audio Freq. Response Configuration *menu is replaced by the* Freq./Lev. *tab with a restricted functionality concerning the frequency deviation handling of each tone. The test tones must be defined by means of the RXAFresp:TDEFinition subsystem; see p. 6.37 f.*

The default configurations of the RXAFresp:TDEFinition subsystem and of its successor, the RXAFresp:MODGenerator subsystem, are identical.

CONFigure:RXAFresp:MODGenerator:ENABle*<Enable>* Mod. Gen. on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF,	Switch on / off test tone no 1	ON	–	
...,				
ON | OFF	Switch on / off test tone no 20	ON	–	

Description of command	FW vers.
This command enables or disables all 20 test tones provided in the `RXAFresp` measurement.	V2.44 ≠V2.50

CONFigure:RXAFresp:MODGenerator:ENABle:TONE<nr> *<Enable>* Mod. Gen. on/off

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on / off test tone <nr>	ON	–	

Description of command	FW vers.
This command enables or disables one of the 20 test tones provided in the `RXAFresp` measurement (<nr> = 1 to 20).	V2.44 ≠V2.50

CONFigure:RXAFresp:MODGenerator:FREQuency *<Frequency>* Test Tone Frequency

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15 999 Hz,	Frequency of test tone no. 1	See below	Hz	
...,	...			
10 Hz to 15 999 Hz	Frequency of test tone no. 20	See below	Hz	

Description of command

This command defines the frequency of the 20 test tones (<nr> = 1 to 20) provided in the `RXAFresp` measurement. All frequencies must be in multiples of 1 Hz, however, several tones may be at the same frequency. The following default test tones are provided:

FW vers.

V2.44
≠V2.50

Tone <nr>	**Frequency/[Hz]**	**Dev./[Hz]**	**Enable**	**Tone <nr>**	**Frequency/[Hz]**	**Dev./[Hz]**	**Enable**
1	240	145.0	ON	11	3100	145.0	ON
2	500	145.0	ON	12	3400	145.0	ON
3	750	145.0	ON	13	3700	145.0	ON
4	1004	145.0	ON	14	4000	145.0	ON
5	1300	145.0	ON	15	4300	145.0	ON
6	1600	145.0	ON	16	4600	145.0	ON
7	1900	145.0	ON	17	4950	145.0	ON
8	2200	145.0	ON	18	5300	145.0	ON
9	2500	145.0	ON	19	5650	145.0	ON
10	2800	145.0	ON	20	6000	145.0	ON

CONFigure:RXAFresp:MODGenerator:FREQuency:TONE<nr> *<Frequency>*

Test Tone Frequency

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 15 999 Hz	Frequency of test tone <nr>	See `CONFigure:RXAFresp:MODGenerator:FREQuency` *`<Frequency>`* command above	Hz	

Description of command

This command defines the frequency of one of the 20 test tones (<nr> = 1 to 20) provided in the `RXAFresp` measurement. All frequencies must be in multiples of 1 Hz, however, several tones may be at the same frequency.

FW vers.

V2.44
≠V2.50

CONFigure:RXAFresp:MODGenerator:FDEViation:FDMODe *<Mode>* Deviation Selection

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
TDEV |	Use total frequency deviation (manual)	TDEV	Hz	
SDEV	Use separate frequency deviations for each tone			

Description of command

This command defines how the frequency deviation of each of the test tones is determined.

- In the default setting `TDEV`, the total modulation generator frequency deviation of 2900 Hz (see command `CONFigure:RXAFresp:MODGenerator:FDEViation:TFDeviation)` is evenly distributed among all 20 enabled test tones. This is identical with the default configuration of the `RXAFresp:TDEFinition` subsystem; see p. 6.68 f.
- To define test tone frequency deviations that differ from each other, the parameter `SDEV` must be selected.

FW vers.

V2.44
≠V2.50

CONFigure:RXAFresp:MODGenerator:FDEViation:TFDeviation *<Total_Dev>* Total Freq. Dev. (Manual)

<Total_Dev>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 20000 Hz	Total frequency deviation (sum of all test tones)	145	Hz	

Description of command	FW vers.
This command defines the total modulation generator frequency deviation that is evenly distributed among all enabled test tones. The total frequency deviation setting comes into effect after the frequency deviation selection mode is set to `TDEV` (see `CONFigure:RXAFresp:MODGenerator:FDEViation:LMODe` command above).	V2.44 ≠V2.50

CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation *<Separate_Devs>* Separate Deviations

<Separate_Devs>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 20000 Hz,	Frequency deviation of test tone no. 1	145	Hz	
...,	...			
10 Hz to 20000 Hz	Frequency deviation of test tone no. 20	145	Hz	

Description of command	FW vers.
This command defines separate modulation generator frequency deviations for all 20 test tones provided in the `RXAFresp` measurement. The frequency deviation settings come into effect after the frequency deviation selection mode is set to `SDEV` (see `CONFigure:RXAFresp:MODGenerator:FDEViation:LMODe` command above).	V2.44 ≠V2.50

CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation:TONE<nr>
<Separate_Dev> Separate Deviation

<Separate_Dev>	Description of parameters	Def. value	Def. unit	Unit ring
10 Hz to 20000 Hz	Frequency deviation of test tone no. <nr>	145	Hz	

Description of command	FW vers.
This command defines separate modulation generator frequency deviations for one of the 20 test tones (<nr> = 1 to 20) provided in the `RXAFresp` measurement. The frequency deviation settings come into effect after the frequency deviation selection mode is set to `SDEV` (see `CONFigure:RXAFresp:MODGenerator:FDEViation:LMODe` command above).	V2.44 ≠V2.50

CONFigure:RXAFresp:MODGenerator:DEFault *<Enable>* Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	V2.44 ≠V2.50

Path Configuration – Subsystem RXAFresp:FILTer

The subsystem *RXAFresp:FILTer* configures the voice-processing equipment used for the *RX Audio Freq. Response* measurement. The subsystem corresponds to the *Filters* tab of the popup menu *RX Audio Freq. Response Configuration.*

CONFigure:RXAFresp:FILTer *<Bandpass>, <Weighting>* Path Configuration: RX Audio Freq. Response

<Bandpass>	Description of parameters	Def. value	Def. unit	Unit ring
	CMU band pass filter with a bandwidth of	BP16	–	
BP01 |	0 Hz to 250 Hz			
BP02 |	6 Hz to 250 Hz			
BP03 |	50 Hz to 250 Hz			
BP04 |	0 Hz to 3000 Hz			
BP05 |	6 Hz to 3000 Hz			
BP06 |	50 Hz to 3000 Hz			
BP07 |	300 Hz to 3000 Hz			
BP08 |	0 Hz to 4000 Hz			
BP09 |	6 Hz to 4000 Hz			
BP10 |	50 Hz to 4000 Hz			
BP11 |	300 Hz to 4000 Hz			
BP12 |	0 Hz to 15000 Hz			
BP13 |	6 Hz to 15000 Hz			
BP14 |	50 Hz to 15000 Hz			
BP15 |	300 Hz to 15000 Hz			
BP16 |	0 Hz to 21000 Hz			
BP17 |	6 Hz to 21000 Hz			
BP 18,	50 Hz to 21000 Hz			
<Weighting>	Description of parameters	Def. value	Def. unit	Unit ring
CME |	Switch on C-message weighted filter	OFF	–	
CCI |	Switch on CCITT weighting filter			
OFF	No weighting filter			
Description of command				FW vers.
This command defines the measuring equipment in the *RX Tests – Sensitivity* application.				V2.41

CONFigure:RXAFresp:FILTer:DEFault ***<Enable>*** Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			
Description of command				FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.				V2.41

Measured Values – Subsystem RXAFresp[:RESult]

The subsystem *RXAFresp[:RESULT]* measures and returns the electrical Audio Frequency Response and compares it with the tolerance values. The subsystem corresponds to the various output elements in the measurement menu *RX Audio Freq. Response*.

READ[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	RX Audio Frequency Response Start single shot measurement and return results	*RUN*
FETCh[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	Read meas. results (unsynchronized)	*RUN*
SAMPle[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	Read results (synchronized)	*RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–150.0 dB to +150.0 dB	AF response at point <nr>	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the RX Audio Frequency Response at test tones <nr> (<nr> = 1 to 20) defined via `CONFigure:RXAFresp:TONE<nr>`.	V2.41

READ:ARRay:RXAFresp[:RESult]?	RX Audio Frequency Response Start single shot measurement and return results	*RUN*
FETCh:ARRay:RXAFresp[:RESult]?	Read meas. results (unsynchronized)	*RUN*
SAMPle:ARRay:RXAFresp[:RESult]?	Read results (synchronized)	*RUN*

Returned values	Description of parameters	Def. value	Def. unit	Unit ring
–150.0 dB to +150.0 dB,	FreqResp[1], 1st value for AF response	NAN	dB	
...	...	...	...	
–150.0 dB to +150.0 dB	FreqResp[20], 20th value for AF resp.	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the RX Audio Frequency Response at the 20 test tones defined via `CONFigure:RXAFresp:TONE<nr>`.	V2.41

READ:SUBarrays:RXAFresp[:RESult]?	Subarray Results Start single shot measurement and return results	*RUN*
FETCh:SUBarrays:RXAFresp[:RESult]?	Read meas. results (unsynchronized)	*RUN*
SAMPle:SUBarrays:RXAFresp[:RESult]?	Read results (synchronized)	*RUN*

Ret. values per subrange	Description of parameters	Def. value	Def. unit	Unit ring
–150.0 dB to +150.0 dB,	FreqResp[1], 1st value for AF response	NAN	dB	
...	...	...	...	
–150.0 dB to +150.0 dB	FreqResp[n], nth value for AF response	NAN	dB	

Description of command	FW vers.
These commands are always queries. They output the AF response in the subranges defined by means of the `CONFigure:SUBarrays:RXAFresp` command. In the default setting of the configuration command the `READ:SUBarrays...`, `FETCh:SUBarrays...`, `and SAMPle:SUBarrays...` command group is equivalent to the `READ:ARRay...`, `FETCh:ARRay...`, `and SAMPle:ARRay...` command group described above. The `CONFigure:SUBarrays:RXAFresp` command defines a maximum of 32 subranges. If one of the statistical modes `(ARIThmetical, MINimum, MAXimum)` is set, only one value is returned by subrange.	V2.41

CALCulate[:SCALar]:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?

Limit Matching

Returned result	Value range	Def. value	Def. unit	Unit ring
Limit matching at tone <nr>	**NMAU | NMAL | INV | OK**	INV	–	

Description of command	FW vers.
This command is always a query. It indicates whether and in which way the error limits at tone <nr> (<nr> = 1 to 20) have been exceeded. The following messages may be output for all measured values:	V2.41

NMAU	Underflow of tolerance value	*not matching, underflow*
NMAL	Tolerance value exceeded	*not matching, overflow*
INV	Measurement invalid	*invalid*
OK	all tolerances matched	

CALCulate:ARRay:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?

Limit Matching, Overall

Returned result	Value range	Def. value	Def. unit	Unit ring
20 bit field,	Indicator for upper limit matching in area 1 to 20,	NAN	–	
20 bit field	Indicator for lower limit matching in area 1 to 20	NAN	–	

Description of command	FW vers.
This command is always a query. Any set bit of the two returned fields indicates that the limits at the corresponding point are exceeded.	V2.41

AMPS Mobile Tests (Signalling Mode)

In the *Signalling* mode, the CMU is able to generate control channel (CC) and voice channel signals and to set up a call to the mobile. A broad range of signalling parameters can be configured and measurements may be performed with a call connection established.

Channel Units – System UNIT

The remote-control commands in the *UNIT* system control the default physical units to be used in certain groups of commands. Default units defined by a *UNIT* command are superseded by an explicit unit definition in one of the associated commands.

UNIT:CHANnel *<Unit>*				RF Channel Units
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
CH | **HZ** | **KHZ** | **MHZ** | **GHZ**	AMPS channel numbers Frequency units	CH	–	
Description of command			Sig. State	FW vers.
This command defines the default unit for all RF channel specifications. This includes the input and output signals in the control channels and voice channels.			all	V2.41

Group Configuration

The remote-control commands in this section are used to configure the measurements in the menu group *AMPS-MS Signalling* globally. They correspond to the settings in the popup menu of the softkey *Group Config.* located to the left of the headline of each main menu.

Subsystem LEVel (RF Input Level)

The subsystem *LEVel* determines the input level for the currently used input. It corresponds to the RF section in the tab *Input Level* in the popup menu *Group Configuration.*

[SENSe:]LEVel:MODE *<Mode>*				Input level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MANual | **VMAC**	Manual setting According to voice mobile attenuation code	VMAC	–	
Description of command			Sig. State	FW vers.
This command defines the mode for setting the maximum input level.			all	V2.41

[SENSe:]LEVel:MAXimum *<Level>*				Max. Level
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 dBm to +53 dBm	Maximum input level for RF 1	+30.0	dBm	
–14 dBm to 39 dBm	Maximum input level for RF 2	+30.0	dBm	
–37 dBm to 0 dBm	Maximum input level for RF 4 IN	+0.0	dBm	

Description of command	Sig. State	FW vers.
This command defines the maximum expected input level. The value range depends on the RF input used and the external attenuation set (see `[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]` command).	all	V2.41

[SENSe:]LEVel:ATTenuation *<Mode>*				Attenuation
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
NORMal |	Mixer level in normal range	NORMal	–	
LNOise |	Low noise (mixer level 10 dB higher than in normal setting)			
LDIStortion	Low distortion (mixer level 10 dB lower than in normal setting)			

Description of command	Sig. State	FW vers.
This command tunes the RF analyzer for normal setting, low noise level (full dynamic range), or low distortion (high intermodulation spacing).	all	V2.41

[SENSe:]LEVel:DEFault				Default Settings
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON |	The parameters are set to their default values	ON	–	
OFF	Some or all parameters differ from the default values			

Description of command	Sig. State	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.	all	V2.41

Subsystem AFLevel (AF Input Level)

The subsystem *AFLevel* determines the input level for the currently used input. It corresponds to the AF section in the tab *Input Level* in the popup menu *Group Configuration*.

[SENSe:]AFLevel:MODE *<Mode>*				Input level – Mode
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
MANual |	Manual setting	MANual	–	
AUTomatic	Automatic setting corresponding to average power of signal applied			

Description of command	Sig. State	FW vers.
This command defines the mode for setting the maximum input level.	all	V2.41

[SENSe:]AFLevel:MAXimum <*Level*> AF Max. Level

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 V to +30 V	Maximum audio input voltage	+0.15	V	
Description of command			Sig. State	FW vers.
This command defines the maximum expected AF input level.			all	V2.41

[SENSe:]AFLevel:DEFault Default Settings

<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | **OFF**	The parameters are set to their default values Some or all parameters differ from the default values	ON	–	
Description of command			Sig. State	FW vers.
If used as a setting command with the parameter *ON* this command sets all parameters of the subsystem to their default values (the setting OFF results in an error message). If used as a query the command returns whether all parameters are set to their default values *(ON)* or not *(OFF)*.			all	V2.41

Connection Control

The remote-control commands presented in this section control the signalling (call setup and release, services, signalling parameters), determine the inputs and outputs as well as the reference frequency. They correspond to the settings in the popup menu of the softkey *Connect. Control* located to the right of the headline of each main menu.

Important note: current vs. default values

> *Some parameters of the CMU assume two independent values: The* default value *is used to set up a call; it can be modified in the signalling states* Signal Off, Signal On *and* Registered. *The* current value *during the call (signalling state* Call Established) *can still be changed, however, modifying this current value does not alter the default value. An example for such a double parameter in AMPS-MS is the BS Signal* VC RF Level.
>
> *Default values are set with a* `CONFigure ...` *command, current values are set with the corresponding* `PROCedure ...` *command.*

Signalling – Subsystem SIGNalling (Call Setup and Cleardown)

The subsystem *SIGNalling* controls the call setup and cleardown from the CMU to the mobile and determines the signalling parameters. Together with the subsystem *SPOWer* (see below) it corresponds to the different index cards *Signalling* (for different signalling states, see command `PROCedure:SIGNalling:ACTion`) in the popup menu *Connect. Control*.

PROCedure:SIGNalling:ACTion *<Action>*				Signalling Control
<Action>	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | **SON |** **CTM |** **CRELease |** **HANDoff |** **OCALl |** **FST**[1]	Switch off CC signal *(signal off)* Switch on CC signal *(signal on)* Call to mobile Call release Handoff Other call Force ST	–	–	–
Description of command			Sig. State	FW vers.
This command has no query form and no default value. It changes between the different signalling states of the CMU.			See below	V2.41

---

[1] The FST parameter is available in firmware versions ≥ V2.44.

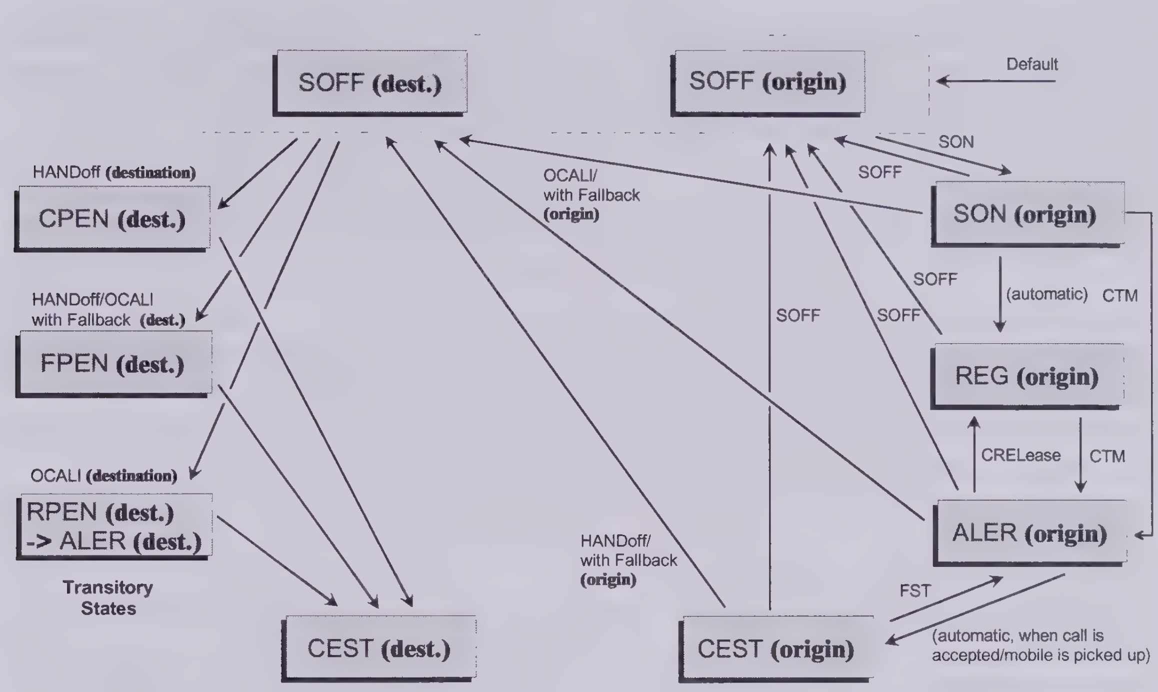


Fig. 6-1 Signalling states of the CMU and transitions including Other Call/Handoff

Signalling states:

See next command, `[SENSe:]SIGNalling:STATe?`

Actions (initiated from the CMU):

See description of command `[PROCedure:]SIGNalling:ACTion`

Further transitions between the signalling states (not shown in Fig. 6-1) may occur, e.g. in case of errors.

[SENSe:]SIGNalling:STATe?				Signalling State
Return	Description of parameters	Def. value	Def. unit	Unit ring
SOFF | **SON |** **REG |** **ALER |** **CEST |** **CPEN |** **RPEN |** **FPEN**	Control channel signal switched off (Signal Off) Control channel signal switched on (Signal On) MS registration performed (Registered) Mobile is ringing (Alerting) Call to mobile set up (Call Established) Call pending (Handoff procedures) Registration pending (Other Call procedures) Fallback pending (Other Call/Handoff procedures)	SOFF	–	–
Description of command			Sig. State	FW vers.
This command is always a query. It returns the current signalling state.			all	V2.41

PROCedure:SIGNalling[:AVC]:CHANnel *<Number>*				Voice Channel
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Number of voice channel	1	–	
Description of command			Sig. State	FW vers.
This command changes the traffic channel number (and thus the frequency) while a call is established.			CEST	V2.41

PROCedure:SIGNalling[:AVC]:MAC <*MAC*> VMAC

<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7	Power of mobile phone in voice MAC units	2	–	–

Description of command	Sig. State	FW vers.
This command changes the mobile attenuation code (and thus the effective radiated power of the mobile phone) while a call is established. For an overview of MACs see chapter 4.	CEST	V2.41

PROCedure:SIGNalling[:AVC]:SAT:PEAKdev <*Deviation*> SAT Peak Deviation

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 20 000 Hz	SAT peak deviation	2000	Hz	–

Description of command	Sig. State	FW vers.
This command changes the maximum frequency deviation that the CMU uses to transmit the SAT to the mobile phone while a call is established.	CEST	V2.41

PROCedure:SIGNalling[:AVC]:SAT:SCC <*Code*> SCC

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
0 | 1 | 2	SAT color code	0	–	–

Description of command	Sig. State	FW vers.
This command changes the SAT color code and thus the frequency of the SAT while a call is established.	CEST	V2.41

Subsystem OCALI (Other Call Target)

The subsystem *OCALI* sets the target for a call from the current to a different network. The corresponding softkeys are located in the index card *Other Call* in the popup menu *Connect. Control*.

STATus:OCALI:TARGet:LIST? Destination List

Response	Description of parameters	Def. value	Def. unit	Unit ring
"IS136800MS", "IS1361900MS", "IS136800MSFallback", "IS1361900MSFallback"	Possible destination list for AMPS mobile	complete list	–	–

Description of command	Sig. State	FW vers.
This command is always a query and returns a list of all networks that are available for a OCALI. On registration, the complete (default) target list is replaced by the actual target list depending on the capabilities of the mobile station.	all	V2.41

CONFigure:OCALI:TARGet <*Target*> Destination Selection

<Target>	Description of parameters	Def. value	Def. unit	Unit ring
"IS136800MS" | "IS1361900MS" | "IS136800MSFallback" | "IS1361900MSFallback" |	Possible destination for AMPS mobile	NONE	–	–
NONE	No OCALI			

Description of command	Sig. State	FW vers.
This command selects a OCALI target. The targets available depend on the capabilities of the mobile station; see previous command. The query returns `NONE` unless a destination has been selected before. OCALI is initiated via the `PROCedure:SIGNalling:ACTion OCALl` command.	SON REG Q: all	V2.41

Subsystem HANDoff (Handoff Target)

The subsystem *HANDoff* sets the target for a forced handoff of the mobile phone. The corresponding softkeys are located in the index card *Handoff* in the popup menu *Connect. Control*.

STATus:HANDoff:TARGet:LIST? Destination List

Response	Description of parameters	Def. value	Def. unit	Unit ring
"IS136800MS", "IS1361900MS", "IS136800MSFallback", "IS1361900MSFallback"	Possible destination list for AMPS mobile	complete list	–	–

Description of command	Sig. State	FW vers.
This command is always a query and returns a list of all networks that are available for a handoff. On registration, the complete (default) target list is replaced by the actual target list depending on the capabilities of the mobile station.	all	V2.41

CONFigure:HANDoff:TARGet <*Target*>	Destination Selection			
<Target>	Description of parameters	Def. value	Def. unit	Unit ring
"IS136800MS" | "IS1361900MS" | "IS136800MSFallback" | "IS1361900MSFallback" |	Possible destination for AMPS mobile	NONE	–	–
NONE	No handoff			

Description of command	Sig. State	FW vers.
This command selects a handoff target. The targets available depend on the capabilities of the mobile station; see previous command. The query returns `NONE` unless a destination has been selected before. Handoff is initiated via the `PROCedure:SIGNalling:ACTion HANDoff` command.	CEST Q: all	V2.41

Subsystem BSSignal (Signal of Base Station/CMU)

The subsystem *BSSignal* configures the control and traffic channels for the signals sent by the CMU to the mobile phone. It corresponds to the index card *BS Signal* in the popup menu *Connect. Control*.

CONFigure:BSSignal:ACC:CHANnel <*Channel*>	Control Channel (CC)			
<Channel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Channel number	333	–	

Description of command	Sig. State	FW vers.
This command determines the RF channel number for the CMU control channel signals (forward channel).	SON SOFF REG Q: all	V2.41

CONFigure:BSSignal:ACC:LEVel <*Level*>	Control Channel RF Level			
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm	Absol. level of control channel, RF1	–30	dBm	
–137 dBm to –10 dBm	Absol. level of control channel, RF2	–30	dBm	
–90 dBm to +13 dBm	Absol. level of control channel, RF 3 OUT	–30	dBm	

Description of command	Sig. State	FW vers.
This command determines the level in the control channel in absolute units.	SON SOFF REG Q: all	V2.41

CONFigure:BSSignal[:AVC]:CHANnel <*AVChannel*>	Voice Channel (VC)			
<AVChannel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Channel number	1	–	

Description of command	Sig. State	FW vers.
This command determines the RF channel number for the CMU voice channel signals (forward channel).	SON SOFF REG Q: all	V2.41

CONFigure:BSSignal[:AVC]:LEVel *<Level>* VC RF Level
PROCedure:BSSignal[:AVC]:LEVel *<Level>*

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm	Absol. level of traffic channel, RF1	–30	dBm	
–137 dBm to –10 dBm	Absol. level of traffic channel, RF2	–30	dBm	
–90 dBm to +13 dBm	Absol. level of traffic channel, RF 3 OUT	–30	dBm	

Description of command	Sig. State	FW vers.
This command determines the level in the voice channel in absolute units. The `CONFigure...` command is available in the signalling states SOFF, SON, and REG. It configures the traffic channel before it is switched on (default value). The `PROCedure...` command is available in the signalling state CEST. With an established call it changes the CMU traffic channel level, sets the device hardware to the new signal level and continues the measurement (current value).	all	V2.41

CONFigure:BSSignal:SAT:PEAKdev *<Deviation>* SAT Peak Deviation

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 20 000 Hz	SAT peak deviation	2000	Hz	–

Description of command	Sig. State	FW vers.
This command specifies the maximum frequency deviation that the CMU uses to transmit the SAT to the mobile phone.	SON SOFF REG Q: all	V2.41

CONFigure:BSSignal:SAT:SCC *<Code>* SCC

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
0 | 1 | 2	SAT color code	0	–	–

Description of command	Sig. State	FW vers.
This command specifies the SAT color code and thus the frequency of the SAT.	SON SOFF REG Q: all	V2.41

CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel *<VChannel>* Other Call/Handoff: RF Channel

<VChannel>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 799 | 990 to 1023	Channel number	1	–	

Description of command	Sig. State	FW vers.
This command determines the RF channel number for the CMU voice channel signals (forward channel VC) that comes into effect after an *Other Call* or *Handoff* from another to the current network.	SON SOFF REG Q: all	V2.41

CONFigure:BSSignal:OCHandoff[:AVC]:LEVel *<Level>* Other Call/Handoff: RF Level

<Level>	Description of parameters	Def. value	Def. unit	Unit ring
–137 dBm to –27 dBm	Absol. level of traffic channel, RF1	–30	dBm	
–137 dBm to –10 dBm	Absol. level of traffic channel, RF2	–30	dBm	
–90 dBm to +13 dBm	Absol. level of traffic channel, RF 3 OUT	–30	dBm	

Description of command	Sig. State	FW vers.
This command determines the level in the traffic channel in absolute units that comes into effect after an *Other Call* or *Handoff* from another to the current network.	all	V2.41

CONFigure:BSSignal:OCHandoff:SAT:PEAKdev *<Deviation>*

Other Call/Handoff: SAT Peak Deviation

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 20 000 Hz	SAT peak deviation	2000	Hz	–

Description of command	Sig. State	FW vers.
This command specifies the maximum frequency deviation that the CMU uses to transmit the SAT to the mobile phone after an *Other Call* or *Handoff* from another to the current network.	all	V2.41

CONFigure:BSSignal:OCHandoff:SAT:SCC *<Code>* Other Call/Handoff: SCC

<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
0 | 1 | 2	SAT color code	0	–	–

Description of command	Sig. State	FW vers.
This command specifies the SAT color code and thus the frequency of the SAT that comes into effect after an *Other Call* or *Handoff* from another to the current network.	all	V2.41

Subsystem NETWork

The subsystem *NETWork* determines the parameters of the radio network and the existing radio link. The subsystem corresponds to the popup menu *Network* in the menu group *Connect. Control*.

Subsystem NETWork:IDENtity

The subsystem *NETWork:IDENtity* defines the identity of the mobile radio network. The subsystem corresponds to the table field *Network Identity* in the popup menu *Network*.

CONFigure:NETWork:IDENtity:SID1 <*Code*>				SID
<Code>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 16383	14-bit SID 1	4	–	–
Description of command			Sig. State	FW vers.
This command defines the 14-bit system identity code. Together with the channel identifyer, the SID 1 forms the 15-bit SID.			SOFF, SON, REG Q: all	V2.41

CONFigure:NETWork:IDENtity:DCC <*Code*>				DCC
<Code>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 3	Digital color code	1	–	–
Description of command			Sig. State	FW vers.
This command defines the digital color code.			SOFF, SON, REG Q: all	V2.41

Subsystem NETWork:SMODe (Signalling Modes)

The subsystem *NETWork:SMODe* defines the signalling parameters controlling the function of the mobile. The subsystem corresponds to the table field *Signalling Modes* in the popup menu *Network*.

CONFigure:NETWork:SMODe:REGH <*Enable*>				Home Registration
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration for home mobiles on/off	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether registration is allowed for home mobiles.			SOFF, SON, REG Q: All	V2.41

CONFigure:NETWork:SMODe:REGR <*Enable*>				Roaming Registration
<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Registration for roaming mobiles on/off	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether registration is allowed for roaming mobiles.			SOFF, SON, REG Q: All	V2.41

CONFigure:NETWork:SMODe:IDMin <*MIN*>				MIN
<MIN>	Description of parameters	Def. value	Def. unit	Unit ring
"0 to $2^{34} - 1$"	34-bit MIN (mobile ident. number)	0	–	–
Description of command			Sig. State	FW vers.
This command defines the default MIN used to set up a call to the mobile phone.			SOFF, SON, REG Q: All	V2.41

Subsystem NETWork:REQuest (Requested Mobile Data)

The subsystem *NETWork:REQuest* determines the signalling parameters of the mobile to be requested. The subsystem corresponds to the table field *Requested Mobile Data* in the popup menu *Network.*

CONFigure:NETWork:REQuest:SNUMber <*Enable*>				Serial Number Request
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Request of the mobile's serial number or no request	ON	–	–
Description of command			Sig. State	FW vers.
This command determines whether the serial number of the mobile phone is requested during registration.			SOFF, SON, REG Q: all	V2.41

Subsystem NETWork[:MS] (Mobile Settings)

The subsystem *NETWork[:MS]* defines the mobile parameters. The subsystem corresponds to the table field *Mobile Settings* in the popup menu *Network.*

CONFigure:NETWork[:MS]:CMAC <*MAC*>				CMAC
<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7	Mobile attenuation code	0	–	
Description of command			Sig. State	FW vers.
This command defines the mobile attenuation code (MAC) for control channel signals. An overview of MAC levels in AMPS and the corresponding effective radiated powers is given in chapter 4.			SOFF, SON REG Q: all	V2.41

CONFigure:NETWork[:MS]:VMAC <*MAC*>				VMAC
<MAC>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7	Mobile attenuation code	2	–	
Description of command			Sig. State	FW vers.
This command defines the mobile attenuation code (MAC) for traffic channel signals. An overview of MAC levels in AMPS and the corresponding effective radiated powers is given in chapter 4.			SOFF, SON REG Q: all	V2.41

CONFigure:NETWork[:MS]:RCFM *<Enable>*		Read Control Filler Message		
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Read control filler message on/off	ON	–	
Description of command			Sig. State	FW vers.
This command determines whether the mobile must read a control filler message before accessing a system.			SOFF, SON REG Q: all	V2.41

Subsystem NETWork:TIMeout

The subsystem *NETWork:TIMeout* defines timeouts for dropping an unused radio link or forcing a registration. The subsystem corresponds to the table field *Timeouts* in the popup menu *Network*.

CONFigure:NETWork:TIMeout:LORLINk *<Time>*		Loss of Radio Link		
<Time>	Description of parameters	Def. value	Def. unit	Unit ring
1 s to 60 s	Loss of radio link	4	s	
Description of command			Sig. State	FW vers.
This command defines the time after which the CMU drops an interrupted connection.			SON, SOFF REG Q: all	V2.41

CONFigure:NETWork:TIMeout:RPERiod *<Time>*		Registration Period		
<Enable>	Description of parameters	Def. value	Def. unit	Unit ring
4 s to 3600 s | **OFF**	Timeout for forced registration No forced registration	10	s	
Description of command			Sig. State	FW vers.
This command determines a period of time after which the CMU forces the mobile station to (re-)register. In the setting OFF, no forced registration takes place.			SON, SOFF REG Q: all	V2.41

Subsystem NETWork:OCHandoff

The subsystem *NETWork:OCHandoff* defines parameters that come into effect after an *Other Call* or a *Handoff* from another to the current network. The subsystem corresponds to the table field *Other Call/Handoff Parameter* in the popup menu *Network*.

CONFigure:NETWork:OCHandoff[:MS]:VMAC <*MAC*>				Other Call/Handoff: VMAC
<*MAC*>	Description of parameters	Def. value	Def. unit	Unit ring
0 to 7	Voice mobile attenuation code	0	–	
Description of command			Sig. State	FW vers.
This command determines the voice MAC that comes into effect after an *Other Call* or *Handoff* from another to the current network.			SON, SOFF REG Q: all	V2.41

Subsystem IOConnector (External Attenuation at the Connectors)

The subsystem *IOConnector* contains the commands for configuration of the input and output connectors. The subsystem corresponds to the index card RF ⊕ in the popup menu *Connect. Control*.

INPut[:STATe] <*State*>				RF Input
<*State*>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 **RF2** **RF4**	Connector RF1 used as input Connector RF2 used as input Connector RF4 IN used as input	RF2	–	–
Description of command			Sig. State	FW vers.
This command determines the connector to be used for RF input signals. The bidirectional connectors RF 1 and RF 2 can be used both as input and output connectors in the same measurement (see `OUTPut[:STATe]`). Only one input and one output may be active at the same time, a new RF input setting supersedes the previous one.			all	V2.41

OUTPut[:STATe] <*State*>				RF Output
<*State*>	Description of parameters	Def. value	Def. unit	Unit ring
RF1 **RF2** **RF3**	Connector RF1 used as output Connector RF2 used as output Connector RF3 OUT used as output	RF2	–	–
Description of command			Sig. State	FW vers.
This command determines the connector to be used for RF output signals. The bidirectional connectors RF 1 and RF 2 can be used as input and output connectors in the same measurement (see `INPut[:STATe]`). Only one input and one output may be active at the same time, a new RF output setting supersedes the previous one.			all	V2.41

[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude] *<Attenuation>*
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] *<Attenuation>* Ext. Att. Input

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB |	External attenuation at input <nr>, (<nr> = 1, 2)	0.0	dB	
–90 dB to +90 dB	External attenuation at input <nr>, (<nr> = 4)	0.0	dB	

Description of command	Sig. State	FW vers.
This command assigns an external attenuation value to the inputs of the instrument *(RF 1, RF 2, RF 4 IN)*.	all	V2.41

[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude] *<Attenuation>*
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude] *<Attenuation>* Ext. Att. Output

<Attenuation>	Description of parameters	Def. value	Def. unit	Unit ring
–50 dB to +50 dB |	External atten. at output <nr>, (<nr> = 1, 2)	0.0	dB	
–90 dB to +90 dB	External atten. at output <nr>, (<nr> = 3)	0.0	dB	

Description of command	Sig. State	FW vers.
This command assigns an external attenuation value to the outputs of the instrument *(RF 1, RF 2, RF 3 OUT)*.	all	V2.41

Subsystem DM:CLOCk (Network Clock)

The subsystem *DM:CLOCk* sets a system clock frequency specific to the network. This frequency is set in the index card *Synch.* in the popup menu *Connect. Control*.

SOURce:DM:CLOCk:STATe *<Mode>* REF OUT 2 on/off

<Mode>	Description of parameters	Def. value	Def. unit	Unit ring
ON | OFF	Switch on/off system clock	OFF	–	–

Description of command	Sig. State	FW vers.
This command switches the system clock at output *REF OUT 2* on or off.	all	V2.41

SOURce:DM:CLOCk:FREQuency <Frequency> REF OUT 2

<Frequency>	Description of parameters	Def. value	Def. unit	Unit ring
9.80 MHz to 39.00 MHz	System clock frequency	13.00	MHz	

Description of command	Sig. State	FW vers.
This command determines the system clock frequency applied to *REF OUT 2*. The frequency entered is internally rounded to one of the following discrete values: 39.00 MHz, 19.50 MHz, 13.00 MHz, 9.75 MHz, 7.80 MHz	all	V2.41

Pseudo Test Object MSSinfo
(Signalling information of mobile phone)

The subsystem *MSSinfo* contains the commands for querying the properties of the mobile phone. The subsystem corresponds to the *Mobile Info* output table in the main menu *AMPS-MS Overview*. The mobile phone properties do not actually represent measured values, they are reported by the mobile phone during registration.

Note:

> *If no mobile is connected, or if the mobile under test is not registered (signalling states* SOFF, SON), *the queries in this section will return the default values* INV. *Most true mobile properties are available in the REG and CEST states, the* `DNUMber` *in the CEST state only. They are overwritten by* INV *as soon as registration is lost (transtion from* REG *or* CEST *to* SON *or* SOFF).

[SENSe:]MSSinfo:MIN[:NUMBer]?				MIN
<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
"Max. 12 digits"	Mobile identification number	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and returns the mobile station identification number.			all	V2.41

[SENSe:]MSSinfo:SN?				SN
<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
0 to $2^{32} – 1$	32-bit Serial Number (SN)	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and returns the Serial Number (SN) of the mobile phone.			all	V2.41

[SENSe:]MSSinfo:PCLass?				Power Class
<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
1 to 3	Power class of the mobile phone	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and returns the power class of the mobile phone. For a list of AMPS power classes and mobile attenuation codes refer to chapter 4.			SOFF, SON REG Q: All	V2.41

[SENSe:]MSSinfo:BANDwidth?				Bandwidth
<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
MH20 | MH25	20 MHz or 25 MHz bandwidth	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and returns the width of the whole RF band used.			all	V2.41

[SENSe:]MSSinfo:MPCI?				MPCI
<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
0 | **1 |** **2 |** **3**	TIA/EIA-553 mobile station TIA/EIA-627 dual-band mobile station reserved TIA/EIA-136 dual-mode mobile station	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and returns the MPCI of the mobile.			all	V2.41

[SENSe:]MSSinfo:DNUMber?				Dialed Number
<Returned Value>	Description of parameters	Def. value	Def. unit	Unit ring
"Max. 16 digits"	Dialed number	INV	–	
Description of command			Sig. State	FW vers.
This command is always a query and returns the number dialed at the mobile station (Call from MS). The current value is available in the CEST signalling state only.			all	V2.41

Generator Object "AFGenerator" – Generator control

The subsystem *AFGenerator* configures the AF signals generated by the CMU. It corresponds to the softkey *AF Generator* in the measurement menu *Analyzer/Generator*.

INITiate:AFGenerator	Start AF generator, reserve resources		*RUN*
ABORt:AFGenerator	Switch off AF generator, release resources		*OFF*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the AF generator, setting it to the status indicated in the top right column.		all	V2.41

FETCh:AFGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the current AF generator status.			all	V2.41

Generator Level – Subsystem AFGenerator:LEVel

The subsystem *AFGenerator:LEVel* determines the voltage of the generated AF signal. It corresponds to the *Level* input field assigned to the *AF Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:AFGenerator:LEVel *<Level>*				AF Voltage
<Level>	Description of parameters	Def. value	Def. unit	Unit ring
0 V to 5 V	Effective (RMS averaged) voltage of the AF signal	0.2	V	
Description of command			Sig. State	FW vers.
This command determines the voltage of the AF signal.			all	V2.41

AF Generator Frequency – Subsystem AFGenerator:FREQuency

The subsystem *AFGenerator:FREQuency* determines the frequency of the generated AF signals. It corresponds to the *Frequency* input field assigned to the *AF Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:AFGenerator:FREQuency *<Frequency>*				AF Frequency
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
20 Hz to 20 000 Hz	AF frequency	1004	Hz	
Description of command			Sig. State	FW vers.
This command defines the frequency of the AF signal generated.			all	V2.41

Generator Object "MODGenerator" – Generator control

The subsystem *MODGenerator* configures the modulation signals generated by the CMU. It corresponds to the softkey *Mod. Generator* in the measurement menu *Analyzer/Generator*.

INITiate:MODGenerator	Start Mod. generator, reserve resources		*RUN*
ABORt:MODGenerator	Switch off Mod. generator, release resources		*OFF*
Description of command		Sig. State	FW vers.
These commands have no query form. They start and stop the modulation generator, setting it to the status indicated in the top right column.		all	V2.41

FETCh:MODGenerator:STATus?				Generator Status
Returned values	Description of parameters	Def. value	Def. unit	Unit ring
OFF | **RUN |** **ERR**	Generator switched off (`ABORt` or `*RST`) Running (`INITiate`) Switched off (could not be started)	OFF	–	
Description of command			Sig. State	FW vers.
This command is always a query. It returns the current modulation generator status.			all	V2.41

Generator Level – Subsystem MODGenerator:LEVel

The subsystem *MODGenerator:LEVel* determines the voltage of the generated modulation signal. It corresponds to the *Level* input field assigned to the *Mod. Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:MODGenerator:DEViation *<Deviation>*				Mod. Deviation
<Deviation>	Description of parameters	Def. value	Def. unit	Unit ring
0 Hz to 20000 Hz	Effective (RMS averaged) voltage of the mod. signal	8000	Hz	
Description of command			Sig. State	FW vers.
This command determines the frequency deviation of the modulation signal.			all	V2.41

Mod. Generator Frequency – Subsystem MODGenerator:FREQuency

The subsystem *MODGenerator:FREQuency* determines the frequency of the generated modulation signals. It corresponds to the *Frequency* input field assigned to the *Mod. Generator* softkey in the measurement menu *Analyzer/Generator*.

SOURce:MODGenerator:FREQuency *<Frequency>*				Mod. Frequency
<Number>	Description of parameters	Def. value	Def. unit	Unit ring
1 Hz to 15 999 Hz	Mod. frequency	1004	Hz	
Description of command			Sig. State	FW vers.
This command defines the frequency of the modulation signal generated.			all	V2.41

List of Commands

In the following, all remote-control commands of the function group AMPS-MS are listed with their parameters and page numbers. They are arranged alphabetically according to the **second** keyword of the command so that related commands belong to the same group. The commands for the two test modes *Non Signalling* and *Signalling* are listed separately.

Commands for AMPS-MS Measurements without Signalling

Table 6-1 Remote-control commands: Non Signalling

Command	Parameter	Remark	Page
AF Generator			
INITiate:AFGenerator	–	no query	6.7
ABORt:AFGenerator	–	no query	6.7
SOURce:AFGenerator:FREQuency	20 Hz to 20000 Hz	with query	6.7
SOURce:AFGenerator:LEVel	<Level>	with query	6.7
FETCh:AFGenerator:STATus?	OFF | RUN | ERR	query only	6.7
AF Input Level			
[SENSe:]AFLevel:DEFault	ON | OFF	with query	6.3
[SENSe:]AFLevel:MAXimum	<Level>	with query	6.3
[SENSe:]AFLevel:MODE	MANual | AUTO	with query	6.3
Inputs and outputs			
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.11
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.11
[SENSe:]CORRection:LOSS:OUTput<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.11
SOURce:CORRection:LOSS:OUTput<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.11
SOURce:DM:CLOCk:FREQuency	7.80 MHz to 39.00 MHz	with query	6.12
SOURce:DM:CLOCk:STATe	ON | OFF	with query	6.12
INPut[:STATe]	RF1 | RF2 | RF4	with query	6.11
OUTPut[:STATe]	RF1 | RF2 | RF3	with query	6.11
RF Input Level			
[SENSe:]LEVel:ATTenuation	NORMal | LNOise | LDIStortion	with query	6.2
[SENSe:]LEVel:DEFault	ON | OFF	with query	6.2
[SENSe:]LEVel:MAXimum	<Level>	with query	6.2
[SENSe:]LEVel:MODE	MANual | AUTO	with query	6.1
Modulation Generator			
INITiate:MODGenerator	–	no query	6.8
ABORt:MODGenerator	–	no query	6.8
SOURce:MODGenerator:Deviation	0 Hz to 20000 Hz	with query	6.8
SOURce:MODGenerator:FREQuency	20 Hz to 20000 Hz	with query	6.8

Command	Parameter	Remark	Page
FETCh:MODGenerator:STATus?	OFF | RUN | ERR	query only	6.8
RF Generator and Analyzer Settings			
[SENSe:]RFANalyzer:FREQuency	200,000 Hz to 2,700,000,000 Hz	with query	6.4
[SENSe:]RFANalyzer:FREQuency:OFFSet	–15 kHz to 15 kHz	with query	6.4
[SENSe:]RFANalyzer:FREQuency:UNIT	Hz | KHZ | MHZ | GHZ | CH	with query	6.4
INITiate:RFGenerator	–	no query	6.5
ABORt:RFGenerator	–	no query	6.5
SOURce:RFGenerator:FREQuency	0.2 MHz to 2700 MHz	with query	6.6
SOURce:RFGenerator:FREQuency:OFFSet	–15 kHz to 15 kHz	with query	6.6
SOURce:RFGenerator:FREQuency:UNIT	Hz | KHZ | MHZ | GHZ | CH	with query	6.6
SOURce:RFGenerator:LEVel	<Level>	with query	6.5
FETCh:RFGenerator:STATus?	OFF | RUN | ERR	query only	6.5
RX Audio Frequency Response Measurement			
INITiate:RXAFresp	–	no query	6.62
ABORt:RXAFresp	–	no query	6.62
STOP:RXAFresp	–	no query	6.62
CONTinue:RXAFresp	–	no query	6.62
CONFigure:SUBarrays:RXAFresp	ALL | ARITHmetical | MINimum | MAXimum,<Range>{,<Range>}	with query	6.65
CONFigure:RXAFresp:CONTrol:AFGLead	0 s to 0.1 s	with query	6.64
CONFigure:RXAFresp:CONTrol:DEFault	ON | OFF	with query	6.64
DISPlay:RXAFresp:CONTrol:GRID	ON | OFF	with query	6.63
CONFigure:RXAFresp:CONTrol:MODGenerator:DEFault	ON | OFF	with query	6.71
CONFigure:RXAFresp:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.63
CONFigure:RXAFresp:CONTrol:RLEVel	0.001 V to 5.000 V	with query	6.63
CONFigure:RXAFresp:CONTrol:RREQuest	RLEV | TON1 | ... | TON20	with query	6.64
CONFigure:RXAFresp:CONTrol:TDEFinition	ON | OFF	with query	6.69
CONFigure:RXAFresp:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.62
CONFigure:RXAFresp:FILTer	<Bandpass>, <Weighting>	with query	6.72
CONFigure:RXAFresp:FILTer:DEFault	ON | OFF	with query	6.72
CONFigure:RXAFresp:LIMit[:LINE]:DEFault	ON | OFF	with query	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit>, <Enable>	with query	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.66
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit>, <Enable>	with query	6.66
CONFigure:RXAFresp:MODGenerator:ENABle	ON | OFF, ON | OFF, ...	with query	6.69
CONFigure:RXAFresp:MODGenerator:ENABle:TONE<nr>	ON | OFF	with query	6.69
CONFigure:RXAFresp:MODGenerator:FDEViation:FDMODe	TDEV | SDEV	with query	6.70
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation	<Separate_Devs>	with query	6.71
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation:TONE<nr>	<Separate_Dev>	with query	6.71

Command	Parameter	Remark	Page
CONFigure:RXAFresp:MODGenerator:FDEViation:TFDeviation	<Total_Dev>	with query	6.71
CONFigure:RXAFresp:MODGenerator:FREQuency	<Frequency>	with query	6.70
CONFigure:RXAFresp:MODGenerator:FREQuency:TONE<nr>	<Frequency>	with query	6.70
FETCh:RXAFresp:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.62
CONFigure:RXAFresp:TDEFinition	<Freq_1>, <Dev_1>, <Enable_1>, ... <Freq_20>, <Dev_20>, <Enable_20>	with query	6.68
CONFigure:RXAFresp:TDEFinition:TONE<nr>	<Frequency>, <Deviation>, ON | OFF	with query	6.68
CALCulate[:SCALar]:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	<Result>	query only	6.74
CALCulate:ARRay:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE?	<Result>	query only	6.74
READ[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.73
FETCh[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.73
SAMPle[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.73
READ:ARRay:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
FETCh:ARRay:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
SAMPle:ARRay:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
READ:SUBarrays:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
FETCh:SUBarrays:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
SAMPle:SUBarrays:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
DISPlay:RXAFresp[:WINDow]:TRACe:Y:SCALe	<ScaleMin>,<ScaleMax>	with query	6.64
RX Tests			
INITiate:RXTests:AFANalyzer	–	no query	6.44
ABORt:RXTests:AFANalyzer	–	no query	6.44
STOP:RXTests:AFANalyzer	–	no query	6.44
CONTinue:RXTests:AFANalyzer	–	no query	6.44
CONFigure:RXTests:AFANalyzer:CONTrol:DEFault	ON | OFF	with query	6.45
CONFigure:RXTests:AFANalyzer:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.45
CONFigure:RXTests:AFANalyzer:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.44
CONFigure:RXTests:AFANalyzer:FILTer	<Bandpass>, <Weighting>	with query	6.47
CONFigure:RXTests:AFANalyzer:FILTer:DEFault	ON | OFF	with query	6.47
CONFigure:RXTests:AFANalyzer:LIMit	<AFVoltMtrMin>, <AFVoltMtrMax>, <AFDist>, <AFSINAD>	with query	6.46
CONFigure:RXTests:AFANalyzer:LIMit:DEFault	ON | OFF	with query	6.46
FETCh:RXTests:AFANalyzer:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.44
INITiate:RXTests:AFANalyzer:VMSinad	–	no query	6.49
ABORt:RXTests:AFANalyzer:VMSinad	–	no query	6.49
STOP:RXTests:AFANalyzer:VMSinad	–	no query	6.49
CONTinue:RXTests:AFANalyzer:VMSinad	–	no query	6.49
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:DEFault	ON | OFF	with query	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:MTIMe	0.025 s to 1 s	with query	6.50

Command	Parameter	Remark	Page
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.49
FETCh:RXTests:AFANalyzer:VMSinad:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.49
CALCulate[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]:MATChing:LIMit?	<Result>	query only	6.51
READ[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	<Result>	query only	6.51
FETCh[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	<Result>	query only	6.51
SAMPle[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	<Result>	query only	6.51
CALCulate[:SCALar]:RXTests:AFANalyzer[:RESult]:MATChing:LIMit?	<Result>	query only	6.48
READ[:SCALar]:RXTests:AFANalyzer[:RESult]?	<Result>	query only	6.48
FETCh[:SCALar]:RXTests:AFANalyzer[:RESult]?	<Result>	query only	6.48
SAMPle[:SCALar]:RXTests:AFANalyzer[:RESult]?	<Result>	query only	6.48
INITiate:RXTests:HNOise	–	no query	6.52
ABORt:RXTests:HNOise	–	no query	6.52
STOP:RXTests:HNOise	–	no query	6.52
CONTinue:RXTests:HNOise	–	no query	6.52
CONFigure:RXTests:HNOise:CONTrol:DEFault	ON | OFF	with query	6.53
CONFigure:RXTests:HNOise:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.53
CONFigure:RXTests:HNOise:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.52
CONFigure:RXTests:HNOise:FILTer	<Bandpass>, <Weighting>	with query	6.55
CONFigure:RXTests:HNOise:FILTer:DEFault	ON | OFF	with query	6.55
CONFigure:RXTests:HNOise:LIMit	<AFVoltmMin>,<AFVoltmMax>,<Hum&Noise>	with query	6.54
CONFigure:RXTests:HNOise:LIMit:DEFault	ON | OFF	with query	6.54
FETCh:RXTests:HNOise:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.52
CALCulate[:SCALar]:RXTests:HNOise[:RESult]:MATChing:LIMit?	<Result>	query only	6.56
READ[:SCALar]:RXTests:HNOise[:RESult]?	<Result>	query only	6.56
FETCh[:SCALar]:RXTests:HNOise[:RESult]?	<Result>	query only	6.56
SAMPle[:SCALar]:RXTests:HNOise[:RESult]?	<Result>	query only	6.56
INITiate:RXTests:SENSitivity	–	no query	6.57
ABORt:RXTests:SENSitivity	–	no query	6.57
STOP:RXTests:SENSitivity	–	no query	6.57
CONTinue:RXTests:SENSitivity	–	no query	6.57
CONFigure:RXTests:SENSitivity:CONTrol:DEFault	ON | OFF	with query	6.58
CONFigure:RXTests:SENSitivity:CONTrol:TSERange	0 dB to 100 dB	with query	6.58
CONFigure:RXTests:SENSitivity:CONTrol:TSINad	–99 dB to +200 dB	with query	6.58
CONFigure:RXTests:SENSitivity:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.57
CONFigure:RXTests:SENSitivity:FILTer	<Bandpass>, <Weighting>	with query	6.60
CONFigure:RXTests:SENSitivity:FILTer:DEFault	ON | OFF	with query	6.60
CONFigure:RXTests:SENSitivity:LIMit	<AFVolmMin>, <AFVoltmMax>, <ErrRange>	with query	6.59

Command	Parameter	Remark	Page
CONFigure:RXTests:SENSitivity:LIMit:DEFault	ON | OFF	with query	6.59
FETCh:RXTests:SENSitivity:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.57
CALCulate[:SCALar]:RXTests:SENSitivity[:RESult]:MATChing:LIMit?	<Result>	query only	6.61
READ[:SCALar]:RXTests:SENSitivity[:RESult]?	<Result>	query only	6.61
FETCh[:SCALar]:RXTests:SENSitivity[:RESult]?	<Result>	query only	6.61
SAMPle[:SCALar]:RXTests:SENSitivity[:RESult]?	<Result>	query only	6.61
SAT Generator			
INITiate:SAT	–	no query	6.9
ABORt:SAT	–	no query	6.9
SOURce:SAT:PEAKdev	1 Hz to 20000 Hz	with query	6.9
SOURce:SAT:SCC	0 | 1 | 2	with query	6.9
FETCh:SAT:STATus?	OFF | RUN | ERR	query only	6.9
ST Generator			
INITiate:ST	–	no query	6.10
ABORt:ST	–	no query	6.10
SOURce:ST:DAT	ON | OFF	with query	6.10
SOURce:ST:PEAKdev	1 Hz to 20000 Hz	with query	6.10
FETCh:ST:STATus?	OFF | RUN | ERR	query only	6.10
TX Audio Freq. Response Measurement			
INITiate:TXAFresp	–	no query	6.31
ABORt:TXAFresp	–	no query	6.31
STOP:TXAFresp	–	no query	6.31
CONTinue:TXAFresp	–	no query	6.31
CONFigure:SUBarrays:TXAFresp	ALL | ARITHmetical | MINimum | MAXimum,<Range>{,<Range>}	with query	6.34
CONFigure:TXAFresp:AFGenerator:ENABle	ON | OFF, ON | OFF, ...	with query	6.38
CONFigure:TXAFresp:AFGenerator:ENABle:TONE<nr>	ON | OFF	with query	6.39
CONFigure:TXAFresp:AFGenerator:FREQuency	<Frequency>	with query	6.39
CONFigure:TXAFresp:AFGenerator:FREQuency:TONE<nr>	<Frequency>	with query	6.39
CONFigure:TXAFresp:AFGenerator:LEVel:LMODe	TLEV | SLEV | SRES	with query	6.39
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel	<Separate_Level>	with query	6.40
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel:TONE<nr>	<Separate_Level>	with query	6.40
CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel	<Total_Level>	with query	6.40
CONFigure:TXAFresp:CONTrol:AFGenerator:DEFault	ON | OFF	with query	6.41
CONFigure:TXAFresp:CONTrol:AFGLead	0 s to 0.1 s	with query	6.33
CONFigure:TXAFresp:CONTrol:DEFault	ON | OFF	with query	6.33
DISPlay:TXAFresp:CONTrol:GRID	ON | OFF	with query	6.32
CONFigure:TXAFresp:CONTrol:RDEViation	10.0 Hz to 10000.0 Hz	with query	6.32
CONFigure:TXAFresp:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.32
CONFigure:TXAFresp:CONTrol:RREQuest	RDEV | TON1 | ... | TON20	with query	6.33

Command	Parameter	Remark	Page
CONFigure:TXAFresp:CONTrol:TDEFinition:DEFault	ON | OFF	with query	6.38
CONFigure:TXAFresp:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.31
CONFigure:TXAFresp:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.41
CONFigure:TXAFresp:FILTer:DEFault	ON | OFF	with query	6.42
CONFigure:TXAFresp:LIMit[:LINE]:DEFault	ON | OFF	with query	6.36
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.36
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit>, <Enable>	with query	6.36
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.35
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit>, <Enable>	with query	6.35
FETCh:TXAFresp:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.31
CONFigure:TXAFresp:TDEFinition	<Freq_1>, <Dev_1>, <Enable_1>, ... <Freq_20>, <Dev_20>, <Enable_20>	with query	6.37
CONFigure:TXAFresp:TDEFinition:TONE<nr>	<Frequency>, <Level>, ON | OFF	with query	6.38
CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	<Result>	query only	6.43
CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	<Result>	query only	6.43
READ[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.42
FETCh[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.42
SAMPle[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.42
READ:ARRay:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.42
FETCh:ARRay:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.42
SAMPle:ARRay:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.42
READ:SUBarrays:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.43
FETCh:SUBarrays:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.43
SAMPle:SUBarrays:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.43
DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe	<ScaleMin>,<ScaleMax>	with query	6.33
TX Tests			
INITiate:TXTests:AFLSearch	–	no query	6.26
ABORt:TXTests:AFLSearch	–	no query	6.26
STOP:TXTests:AFLSearch	–	no query	6.26
CONTinue:TXTests:AFLSearch	–	no query	6.26
CONFigure:TXTests:AFLSearch:CONTrol:DEFault	ON | OFF	with query	6.27
CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation	<TargetDev>	with query	6.27
CONFigure:TXTests:AFLSearch:CONTrol:TDERange	<ErrRange>	with query	6.27
CONFigure:TXTests:AFLSearch:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.26
CONFigure:TXTests:AFLSearch:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.29
CONFigure:TXTests:AFLSearch:FILTer:DEFault	ON | OFF	with query	6.29
CONFigure:TXTests:AFLSearch:LIMit	<CarrierFrequencyError>	with query	6.28
CONFigure:TXTests:AFLSearch:LIMit:DEFault	ON | OFF	with query	6.28
FETCh:TXTests:AFLSearch:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.26

Command	Parameter	Remark	Page
CALCulate[:SCALar]:TXTests:AFLSearch[:RESult]:MATChing?	<Result>	query only	6.30
READ[:SCALar]:TXTests:AFLSearch[:RESult]?	<Result>	query only	6.30
FETCh[:SCALar]:TXTests:AFLSearch[:RESult]?	<Result>	query only	6.30
SAMPle[:SCALar]:TXTests:AFLSearch[:RESult]?	<Result>	query only	6.30
INITiate:TXTests:HNOise	–	no query	6.21
ABORt:TXTests:HNOise	–	no query	6.21
STOP:TXTests:HNOise	–	no query	6.21
CONTinue:TXTests:HNOise	–	no query	6.21
CONFigure:TXTests:HNOise:CONTrol:DEFault	ON | OFF	with query	6.22
CONFigure:TXTests:HNOise:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.22
CONFigure:TXTests:HNOise:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.21
CONFigure:TXTests:HNOise:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.24
CONFigure:TXTests:HNOise:FILTer:DEFault	ON | OFF	with query	6.24
CONFigure:TXTests:HNOise:LIMit	<CarrierFreqError>, <SATFreqError>,<SATPeakDev>,<Hum&Noise>	with query	6.23
CONFigure:TXTests:HNOise:LIMit:DEFault	ON | OFF	with query	6.23
FETCh:TXTests:HNOise:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.21
CALCulate[:SCALar]:TXTests:HNOise[:RESult]:MATChing:LIMit?	<Result>	query only	6.25
READ[:SCALar]:TXTests:HNOise[:RESult]?	<Result>	query only	6.25
FETCh[:SCALar]:TXTests:HNOise[:RESult]?	<Result>	query only	6.25
SAMPle[:SCALar]:TXTests:HNOise[:RESult]?	<Result>	query only	6.25
INITiate:TXTests:MODulation	–	no query	6.16
ABORt:TXTests:MODulation	–	no query	6.16
STOP:TXTests:MODulation	–	no query	6.16
CONTinue:TXTests:MODulation	–	no query	6.16
CONFigure:TXTests:MODulation:CONTrol:DEFault	ON | OFF	with query	6.17
CONFigure:TXTests:MODulation:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.17
CONFigure:TXTests:MODulation:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.16
CONFigure:TXTests:MODulation:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.19
CONFigure:TXTests:MODulation:FILTer:DEFault	ON | OFF	with query	6.19
CONFigure:TXTests:MODulation:LIMit	<CarrFreqErrRange>, <TotPeakDevMax>, <SATFreqErrRge>, <SATPeakDevErrRge>, <STFreqErrRange>, <STPeakDevErrRge>, <ModDistNoise>, <ResAM>	with query	6.18
CONFigure:TXTests:MODulation:LIMit:DEFault	ON | OFF	with query	6.18
FETCh:TXTests:MODulation:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.16
CALCulate[:SCALar]:TXTests:MODulation[:RESult]:MATChing:LIMit?	<Result>	query only	6.20

Command	Parameter	Remark	Page
READ[:SCALar]:TXTests:MODulation[:RESult]?	<Result>	query only	6.20
FETCh[:SCALar]:TXTests:MODulation[:RESult]?	<Result>	query only	6.20
SAMPle[:SCALar]:TXTests:MODulation[:RESult]?	<Result>	query only	6.20
Wide-Band Power			
INITiate:WPOWer	–	no query	6.13
ABORt:WPOWer	–	no query	6.13
STOP:WPOWer	–	no query	6.13
CONTinue:WPOWer	–	no query	6.13
CONFigure:WPOWer:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.14
CONFigure:WPOWer:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.14
FETCh:WPOWer:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.14
READ[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.15
FETCh[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.15
SAMPle[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.15

Commands for AMPS-MS Measurements with Signalling

Table 6-2 Remote-control commands: Signalling mode

Command	Parameter	Remark	Page
AF Generator			
INITiate:AFGenerator	–	no query	6.92
ABORt:AFGenerator	–	no query	6.92
SOURce:AFGenerator:FREQuency	20 Hz to 20000 Hz	with query	6.92
SOURce:AFGenerator:LEVel	<Level>	with query	6.92
FETCh:AFGenerator:STATus?	OFF | RUN | ERR	query only	6.92
AF Input Level			
[SENSe:]AFLevel:DEFault	ON | OFF	with query	6.77
[SENSe:]AFLevel:MAXimum	<Level>	with query	6.77
[SENSe:]AFLevel:MODE	MANual | AUTO	with query	6.76
RF Signals of the CMU (Base Station)			
CONFigure:BSSignal:ACC:CHANnel	<Channel>	with query	6.82
CONFigure:BSSignal:ACC:LEVel	<Level>	with query	6.82
CONFigure:BSSignal:OCHandoff:SAT:PEAKdev	1 Hz to 20000 Hz	with query	6.84
CONFigure:BSSignal:OCHandoff:SAT:SCC	0 | 1 | 2	with query	6.84
CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel	<VChannel>	with query	6.83
CONFigure:BSSignal:OCHandoff[:AVC]:LEVel	<Level>	with query	6.84
CONFigure:BSSignal:SAT:PEAKdev	1 Hz to 20000 Hz	with query	6.83
CONFigure:BSSignal:SAT:SCC	0 | 1 | 2	with query	6.83
CONFigure:BSSignal[:AVC]:CHANnel	<AVCChannel>	with query	6.82
CONFigure:BSSignal[:AVC]:LEVel	<Level>	with query	6.83
PROCedure:BSSignal[:AVC]:LEVel	<Level>	with query	6.83
Channel Unit			
UNIT:CHANnel	CH | HZ | KHZ | MHZ | GHZ	with query	6.75
Inputs and Outputs			
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.89
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	–50 dB to +50 dB	with query	6.89
[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.89
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude]	–50 dB to 50 dB	with query	6.89
SOURce:DM:CLOCk:FREQuency	1.219 MHz to 39.000 MHz	with query	6.89
SOURce:DM:CLOCk:STATe	ON | OFF	with query	6.89
INPut[:STATe]	RF1 | RF2 | RF4	with query	6.88
OUTPut[:STATe]	RF1 | RF2 | RF3	with query	6.88
Handoff Target			
CONFigure:HANDoff:TARGet	<Target>	with query	6.82
STATus:HANDoff:TARGet:LIST?	<List>	query only	6.81

Command	Parameter	Remark	Page
RF Input Level			
[SENSe:]LEVel:ATTenuation	NORMal | LNOise | LDIStortion	with query	6.76
[SENSe:]LEVel:DEFault	ON | OFF	with query	6.76
[SENSe:]LEVel:MAXimum	<Level>	with query	6.76
[SENSe:]LEVel:MODE	MANual | AUTO	with query	6.75
Modulation Generator			
INITiate:MODGenerator	–	no query	6.93
ABORt:MODGenerator	–	no query	6.93
SOURce:MODGenerator:Deviation	0 Hz to 20000 Hz	with query	6.93
SOURce:MODGenerator:FREQuency	20 Hz to 20000 Hz	with query	6.93
FETCh:MODGenerator:STATus?	OFF | RUN | ERR	query only	6.93
Mobile Info			
[SENSe:]MSSinfo:BANDwidth?	<numeric_value>	query only	6.90
[SENSe:]MSSinfo:DNUMber?	<numeric_value>	query only	6.91
[SENSe:]MSSinfo:MIN[:NUMBer]?	<numeric_value>	query only	6.90
[SENSe:]MSSinfo:MPCI?	'<Protocol_Capability>'	query only	6.91
[SENSe:]MSSinfo:PCLass?	<numeric_value>	query only	6.90
[SENSe:]MSSinfo:SN?	<numeric_value>	query only	6.90
Network Parameters			
CONFigure:NETWork:IDENtity:DCC	0 to 999	with query	6.85
CONFigure:NETWork:IDENtity:SID1	0 to 16383	with query	6.85
CONFigure:NETWork:OCHandoff[:MS]:VMAC	0 to 7	with query	6.88
CONFigure:NETWork:REQuest:SNUMber	ON | OFF	with query	6.86
CONFigure:NETWork:SMODe:IDMin	0 to $2^{34} - 1$	with query	6.86
CONFigure:NETWork:SMODe:REGH	ON | OFF	with query	6.85
CONFigure:NETWork:SMODe:REGR	ON | OFF	with query	6.85
CONFigure:NETWork:TIMeout:LORLINk	4 to 64	with query	6.87
CONFigure:NETWork:TIMeout:RPERiod	0 s to 60 s | OFF	with query	6.87
CONFigure:NETWork[:MS]:CMAC	0 to 7	with query	6.86
CONFigure:NETWork[:MS]:RCFM	ON | OFF	with query	6.87
CONFigure:NETWork[:MS]:VMAC	0 to 7	with query	6.86
Other Call Target			
CONFigure:OCALl:TARGet	<Target>	with query	6.81
STATus:OCALl:TARGet:LIST?	<List>	query only	6.81
RX Audio Frequency Response Measurement			
INITiate:RXAFresp	–	no query	6.62
ABORt:RXAFresp	–	no query	6.62
STOP:RXAFresp	–	no query	6.62
CONTinue:RXAFresp	–	no query	6.62

Command	Parameter	Remark	Page
CONFigure:SUBarrays:RXAFresp	ALL | ARITHmetical | MINimum | MAXimum,<Range>{,<Range>}	with query	6.65
CONFigure:RXAFresp:CONTrol:AFGLead	0 s to 0.1 s	with query	6.64
CONFigure:RXAFresp:CONTrol:DEFault	ON | OFF	with query	6.64
DISPlay:RXAFresp:CONTrol:GRID	ON | OFF	with query	6.63
CONFigure:RXAFresp:CONTrol:MODGenerator:DEFault	ON | OFF	with query	6.71
CONFigure:RXAFresp:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.63
CONFigure:RXAFresp:CONTrol:RLEVel	0.001 V to 5.000 V	with query	6.63
CONFigure:RXAFresp:CONTrol:RREQuest	RLEV | TON1 | ... | TON20	with query	6.64
CONFigure:RXAFresp:CONTrol:TDEFinition	ON | OFF	with query	6.69
CONFigure:RXAFresp:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.62
CONFigure:RXAFresp:FILTer	<Bandpass>, <Weighting>	with query	6.72
CONFigure:RXAFresp:FILTer:DEFault	ON | OFF	with query	6.72
CONFigure:RXAFresp:LIMit[:LINE]:DEFault	ON | OFF	with query	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit>, <Enable>	with query	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.66
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit>, <Enable>	with query	6.66
CONFigure:RXAFresp:MODGenerator:ENABle	ON | OFF, ON | OFF, ...	with query	6.69
CONFigure:RXAFresp:MODGenerator:ENABle:TONE<nr>	ON | OFF	with query	6.69
CONFigure:RXAFresp:MODGenerator:FDEViation:FDMODe	TDEV | SDEV	with query	6.70
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation	<Separate_Devs>	with query	6.71
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation:TONE<nr>	<Separate_Dev>	with query	6.71
CONFigure:RXAFresp:MODGenerator:FDEViation:TFDeviation	<Total_Dev>	with query	6.71
CONFigure:RXAFresp:MODGenerator:FREQuency	<Frequency>	with query	6.70
CONFigure:RXAFresp:MODGenerator:FREQuency:TONE<nr>	<Frequency>	with query	6.70
FETCh:RXAFresp:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.62
CONFigure:RXAFresp:TDEFinition	<Freq_1>, <Dev_1>, <Enable_1>, ... <Freq_20>, <Dev_20>, <Enable_20>	with query	6.68
CONFigure:RXAFresp:TDEFinition:TONE<nr>	<Frequency>, <Deviation>, ON | OFF	with query	6.68
CALCulate[:SCALar]:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	<Result>	query only	6.74
CALCulate:ARRay:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE?	<Result>	query only	6.74
READ[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.73
FETCh[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.73
SAMPle[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.73
READ:ARRay:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
FETCh:ARRay:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
SAMPle:ARRay:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73

Command	Parameter	Remark	Page
READ:SUBarrays:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
FETCh:SUBarrays:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
SAMPle:SUBarrays:RXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.73
DISPlay:RXAFresp[:WINDow]:TRACe:Y:SCALe	<ScaleMin>,<ScaleMax>	with query	6.64
RX Tests			
INITiate:RXTests:AFANalyzer	–	no query	6.44
ABORt:RXTests:AFANalyzer	–	no query	6.44
STOP:RXTests:AFANalyzer	–	no query	6.44
CONTinue:RXTests:AFANalyzer	–	no query	6.44
CONFigure:RXTests:AFANalyzer:CONTrol:DEFault	ON | OFF	with query	6.45
CONFigure:RXTests:AFANalyzer:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.45
CONFigure:RXTests:AFANalyzer:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.44
CONFigure:RXTests:AFANalyzer:FILTer	<Bandpass>, <Weighting>	with query	6.47
CONFigure:RXTests:AFANalyzer:FILTer:DEFault	ON | OFF	with query	6.47
CONFigure:RXTests:AFANalyzer:LIMit	<AFVoltMtrMin>, <AFVoltMtrMax>, <AFDist>, <AFSINAD>	with query	6.46
CONFigure:RXTests:AFANalyzer:LIMit:DEFault	ON | OFF	with query	6.46
FETCh:RXTests:AFANalyzer:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.44
INITiate:RXTests:AFANalyzer:VMSinad	–	no query	6.49
ABORt:RXTests:AFANalyzer:VMSinad	–	no query	6.49
STOP:RXTests:AFANalyzer:VMSinad	–	no query	6.49
CONTinue:RXTests:AFANalyzer:VMSinad	–	no query	6.49
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:DEFault	ON | OFF	with query	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:MTIMe	0.025 s to 1 s	with query	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.49
FETCh:RXTests:AFANalyzer:VMSinad:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.49
CALCulate[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]:MATChing:LIMit?	<Result>	query only	6.51
READ[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	<Result>	query only	6.51
FETCh[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	<Result>	query only	6.51
SAMPle[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	<Result>	query only	6.51
CALCulate[:SCALar]:RXTests:AFANalyzer[:RESult]:MATChing:LIMit?	<Result>	query only	6.48
READ[:SCALar]:RXTests:AFANalyzer[:RESult]?	<Result>	query only	6.48
FETCh[:SCALar]:RXTests:AFANalyzer[:RESult]?	<Result>	query only	6.48
SAMPle[:SCALar]:RXTests:AFANalyzer[:RESult]?	<Result>	query only	6.48
INITiate:RXTests:HNOise	–	no query	6.52
ABORt:RXTests:HNOise	–	no query	6.52
STOP:RXTests:HNOise	–	no query	6.52
CONTinue:RXTests:HNOise	–	no query	6.52
CONFigure:RXTests:HNOise:CONTrol:DEFault	ON | OFF	with query	6.53

Command	Parameter	Remark	Page
CONFigure:RXTests:HNOise:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.53
CONFigure:RXTests:HNOise:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.52
CONFigure:RXTests:HNOise:FILTer	<Bandpass>, <Weighting>	with query	6.55
CONFigure:RXTests:HNOise:FILTer:DEFault	ON | OFF	with query	6.55
CONFigure:RXTests:HNOise:LIMit	<AFVoltmMin>,<AFVoltmMax>,<Hum&Noise>	with query	6.54
CONFigure:RXTests:HNOise:LIMit:DEFault	ON | OFF	with query	6.54
FETCh:RXTests:HNOise:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.52
CALCulate[:SCALar]:RXTests:HNOise[:RESult]:MATChing:LIMit?	<Result>	query only	6.56
READ[:SCALar]:RXTests:HNOise[:RESult]?	<Result>	query only	6.56
FETCh[:SCALar]:RXTests:HNOise[:RESult]?	<Result>	query only	6.56
SAMPle[:SCALar]:RXTests:HNOise[:RESult]?	<Result>	query only	6.56
INITiate:RXTests:SENSitivity	–	no query	6.57
ABORt:RXTests:SENSitivity	–	no query	6.57
STOP:RXTests:SENSitivity	–	no query	6.57
CONTinue:RXTests:SENSitivity	–	no query	6.57
CONFigure:RXTests:SENSitivity:CONTrol:DEFault	ON | OFF	with query	6.58
CONFigure:RXTests:SENSitivity:CONTrol:TSERange	0 dB to 100 dB	with query	6.58
CONFigure:RXTests:SENSitivity:CONTrol:TSINad	–99 dB to +200 dB	with query	6.58
CONFigure:RXTests:SENSitivity:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.57
CONFigure:RXTests:SENSitivity:FILTer	<Bandpass>, <Weighting>	with query	6.60
CONFigure:RXTests:SENSitivity:FILTer:DEFault	ON | OFF	with query	6.60
CONFigure:RXTests:SENSitivity:LIMit	<AFVolmMin>, <AFVoltmMax>, <ErrRange>	with query	6.59
CONFigure:RXTests:SENSitivity:LIMit:DEFault	ON | OFF	with query	6.59
FETCh:RXTests:SENSitivity:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.57
CALCulate[:SCALar]:RXTests:SENSitivity[:RESult]:MATChing:LIMit?	<Result>	query only	6.61
READ[:SCALar]:RXTests:SENSitivity[:RESult]?	<Result>	query only	6.61
FETCh[:SCALar]:RXTests:SENSitivity[:RESult]?	<Result>	query only	6.61
SAMPle[:SCALar]:RXTests:SENSitivity[:RESult]?	<Result>	query only	6.61
Signalling			
PROCedure:SIGNalling:ACTion	SOFF | SON | CTM | CRELease | HANDoff | OCALl	with query	6.78
[SENSe:]SIGNalling:STATe?	SOFF | SON | REG | ALER | CEST | CPEN | RPEN | FPEN	query only	6.79
PROCedure:SIGNalling[:AVC]:CHANnel	<Number>	with query	6.79
PROCedure:SIGNalling[:AVC]:MAC	0 to 7	with query	6.80
PROCedure:SIGNalling[:AVC]:SAT:PEAKdev	1 Hz to 20000 Hz	with query	6.80
PROCedure:SIGNalling[:AVC]:SAT:SCC	0 | 1 | 2	with query	6.80
TX Audio Freq. Response Measurement			
INITiate:TXAFresp	–	no query	6.31

Command	Parameter	Remark	Page
ABORt:TXAFresp	–	no query	6.31
STOP:TXAFresp	–	no query	6.31
CONTinue:TXAFresp	–	no query	6.31
CONFigure:SUBarrays:TXAFresp	ALL | ARITHmetical | MINimum | MAXimum,<Range>{,<Range>}	with query	6.34
CONFigure:TXAFresp:AFGenerator:ENABle	ON | OFF, ON | OFF, ...	with query	6.38
CONFigure:TXAFresp:AFGenerator:ENABle:TONE<nr>	ON | OFF	with query	6.39
CONFigure:TXAFresp:AFGenerator:FREQuency	<Frequency>	with query	6.39
CONFigure:TXAFresp:AFGenerator:FREQuency:TONE<nr>	<Frequency>	with query	6.39
CONFigure:TXAFresp:AFGenerator:LEVel:LMODe	TLEV | SLEV | SRES	with query	6.39
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel	<Separate_Level>	with query	6.40
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel:TONE<nr>	<Separate_Level>	with query	6.40
CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel	<Total_Level>	with query	6.40
CONFigure:TXAFresp:CONTrol:AFGenerator:DEFault	ON | OFF	with query	6.41
CONFigure:TXAFresp:CONTrol:AFGLead	0 s to 0.1 s	with query	6.33
CONFigure:TXAFresp:CONTrol:DEFault	ON | OFF	with query	6.33
DISPlay:TXAFresp:CONTrol:GRID	ON | OFF	with query	6.32
CONFigure:TXAFresp:CONTrol:RDEViation	10.0 Hz to 10000.0 Hz	with query	6.32
CONFigure:TXAFresp:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.32
CONFigure:TXAFresp:CONTrol:RREQuest	RDEV | TON1 | ... | TON20	with query	6.33
CONFigure:TXAFresp:CONTrol:TDEFinition:DEFault	ON | OFF	with query	6.38
CONFigure:TXAFresp:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.31
CONFigure:TXAFresp:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.41
CONFigure:TXAFresp:FILTer:DEFault	ON | OFF	with query	6.42
CONFigure:TXAFresp:LIMit[:LINE]:DEFault	ON | OFF	with query	6.36
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.36
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	<Limit>, <Enable>	with query	6.36
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit_1>, <Enable_1>, ... <Limit_20>, <Enable_20>	with query	6.35
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	<Limit>, <Enable>	with query	6.35
FETCh:TXAFresp:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.31
CONFigure:TXAFresp:TDEFinition	<Freq_1>, <Dev_1>, <Enable_1>, ... <Freq_20>, <Dev_20>, <Enable_20>	with query	6.37
CONFigure:TXAFresp:TDEFinition:TONE<nr>	<Frequency>, <Level>, ON | OFF	with query	6.38
CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	<Result>	query only	6.43
CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	<Result>	query only	6.43
READ[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.42
FETCh[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.42
SAMPle[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	–150.0 dB to +150.0 dB	query only	6.42
READ:ARRay:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.42
FETCh:ARRay:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.42

Command	Parameter	Remark	Page
SAMPle:ARRay:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.42
READ:SUBarrays:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.43
FETCh:SUBarrays:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.43
SAMPle:SUBarrays:TXAFresp[:RESult]?	–150.0 dB to +150.0 dB	query only	6.43
DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe	<ScaleMin>,<ScaleMax>	with query	6.33
TX Tests			
INITiate:TXTests:AFLSearch	–	no query	6.26
ABORt:TXTests:AFLSearch	–	no query	6.26
STOP:TXTests:AFLSearch	–	no query	6.26
CONTinue:TXTests:AFLSearch	–	no query	6.26
CONFigure:TXTests:AFLSearch:CONTrol:DEFault	ON | OFF	with query	6.27
CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation	<TargetDev>	with query	6.27
CONFigure:TXTests:AFLSearch:CONTrol:TDERange	<ErrRange>	with query	6.27
CONFigure:TXTests:AFLSearch:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.26
CONFigure:TXTests:AFLSearch:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.29
CONFigure:TXTests:AFLSearch:FILTer:DEFault	ON | OFF	with query	6.29
CONFigure:TXTests:AFLSearch:LIMit	<CarrierFrequencyError>	with query	6.28
CONFigure:TXTests:AFLSearch:LIMit:DEFault	ON | OFF	with query	6.28
FETCh:TXTests:AFLSearch:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.26
CALCulate[:SCALar]:TXTests:AFLSearch[:RESult]:MATChing?	<Result>	query only	6.30
READ[:SCALar]:TXTests:AFLSearch[:RESult]?	<Result>	query only	6.30
FETCh[:SCALar]:TXTests:AFLSearch[:RESult]?	<Result>	query only	6.30
SAMPle[:SCALar]:TXTests:AFLSearch[:RESult]?	<Result>	query only	6.30
INITiate:TXTests:HNOise	–	no query	6.21
ABORt:TXTests:HNOise	–	no query	6.21
STOP:TXTests:HNOise	–	no query	6.21
CONTinue:TXTests:HNOise	–	no query	6.21
CONFigure:TXTests:HNOise:CONTrol:DEFault	ON | OFF	with query	6.22
CONFigure:TXTests:HNOise:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.22
CONFigure:TXTests:HNOise:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.21
CONFigure:TXTests:HNOise:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.24
CONFigure:TXTests:HNOise:FILTer:DEFault	ON | OFF	with query	6.24
CONFigure:TXTests:HNOise:LIMit	<CarrierFreqError>, <SATFreqError>,<SATPeakDev>,<Hum&Noise>	with query	6.23
CONFigure:TXTests:HNOise:LIMit:DEFault	ON | OFF	with query	6.23
FETCh:TXTests:HNOise:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.21
CALCulate[:SCALar]:TXTests:HNOise[:RESult]:MATChing:LIMit?	<Result>	query only	6.25
READ[:SCALar]:TXTests:HNOise[:RESult]?	<Result>	query only	6.25
FETCh[:SCALar]:TXTests:HNOise[:RESult]?	<Result>	query only	6.25

Command	**Parameter**	**Remark**	**Page**
SAMPle[:SCALar]:TXTests:HNOise[:RESult]?	<Result>	query only	6.25
INITiate:TXTests:MODulation	–	no query	6.16
ABORt:TXTests:MODulation	–	no query	6.16
STOP:TXTests:MODulation	–	no query	6.16
CONTinue:TXTests:MODulation	–	no query	6.16
CONFigure:TXTests:MODulation:CONTrol:DEFault	ON | OFF	with query	6.17
CONFigure:TXTests:MODulation:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE, STEP | NONE	with query	6.17
CONFigure:TXTests:MODulation:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.16
CONFigure:TXTests:MODulation:FILTer	<Bandpass>, <Expandor>, <Deemphasis>, <Weighting>	with query	6.19
CONFigure:TXTests:MODulation:FILTer:DEFault	ON | OFF	with query	6.19
CONFigure:TXTests:MODulation:LIMit	<CarrFreqErrRange>, <TotPeakDevMax>, <SATFreqErrRge>, <SATPeakDevErrRge>, <STFreqErrRange>, <STPeakDevErrRge>, <ModDistNoise>, <ResAM>	with query	6.18
CONFigure:TXTests:MODulation:LIMit:DEFault	ON | OFF	with query	6.18
FETCh:TXTests:MODulation:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.16
CALCulate[:SCALar]:TXTests:MODulation[:RESult]:MATChing:LIMit?	<Result>	query only	6.20
READ[:SCALar]:TXTests:MODulation[:RESult]?	<Result>	query only	6.20
FETCh[:SCALar]:TXTests:MODulation[:RESult]?	<Result>	query only	6.20
SAMPle[:SCALar]:TXTests:MODulation[:RESult]?	<Result>	query only	6.20
Wide-Band Power			
INITiate:WPOWer	–	no query	6.13
ABORt:WPOWer	–	no query	6.13
STOP:WPOWer	–	no query	6.13
CONTinue:WPOWer	–	no query	6.13
CONFigure:WPOWer:CONTrol:REPetition	CONTinuous | SINGleshot | 1 to 10000, SONerror | NONE,STEP | NONE	with query	6.14
CONFigure:WPOWer:EREPorting	SRQ | SOPC | SRSQ | OFF	with query	6.14
FETCh:WPOWer:STATus?	OFF | RUN | STOP | ERR | STEP | RDY, 1 to 10000 | NONE	query only	6.14
READ[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.15
FETCh[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.15
SAMPle[:SCALar]:WPOWer[:RESult]?	–30 dBm to 30 dBm	query only	6.15

Alphabetical Command Lists

Table 6-3 Remote-control commands: *Non Signalling* mode

Command (Non Signalling, alphabetical)	**Page**
ABORt:AFGenerator	*6.7*
ABORt:MODGenerator	*6.8*
ABORt:RFGenerator	*6.5*
ABORt:RXAFresp	*6.62*
ABORt:RXTests:AFANalyzer	*6.44*
ABORt:RXTests:AFANalyzer:VMSinad	*6.49*
ABORt:RXTests:HNOise	*6.52*
ABORt:RXTests:SENSitivity	*6.57*
ABORt:SAT	*6.9*
ABORt:ST	*6.10*
ABORt:TXAFresp	*6.31*
ABORt:TXTests:AFLSearch	*6.26*
ABORt:TXTests:HNOise	*6.21*
ABORt:TXTests:MODulation	*6.16*
ABORt:WPOWer	*6.13*
CALCulate:ARRay:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE?	*6.74*
CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	*6.43*
CALCulate[:SCALar]:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	*6.74*
CALCulate[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]:MATChing:LIMit?	*6.51*
CALCulate[:SCALar]:RXTests:AFANalyzer[:RESult]:MATChing:LIMit?	*6.48*
CALCulate[:SCALar]:RXTests:HNOise[:RESult]:MATChing:LIMit?	*6.56*
CALCulate[:SCALar]:RXTests:SENSitivity[:RESult]:MATChing:LIMit?	*6.61*
CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	*6.43*
CALCulate[:SCALar]:TXTests:AFLSearch[:RESult]:MATChing?	*6.30*
CALCulate[:SCALar]:TXTests:HNOise[:RESult]:MATChing:LIMit?	*6.25*
CALCulate[:SCALar]:TXTests:MODulation[:RESult]:MATChing:LIMit?	*6.20*
CONFigure:RXAFresp:CONTrol:AFGLead	*6.64*
CONFigure:RXAFresp:CONTrol:DEFault	*6.64*
CONFigure:RXAFresp:CONTrol:MODGenerator:DEFault	*6.71*
CONFigure:RXAFresp:CONTrol:REPetition	*6.63*
CONFigure:RXAFresp:CONTrol:RLEVel	*6.63*
CONFigure:RXAFresp:CONTrol:RREQuest	*6.64*
CONFigure:RXAFresp:CONTrol:TDEFinition	*6.69*
CONFigure:RXAFresp:EREPorting	*6.62*
CONFigure:RXAFresp:FILTer	*6.72*
CONFigure:RXAFresp:FILTer:DEFault	*6.72*
CONFigure:RXAFresp:LIMit[:LINE]:DEFault	*6.67*
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	*6.67*
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	*6.67*
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	*6.66*
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	*6.66*
CONFigure:RXAFresp:MODGenerator:ENABle	*6.69*
CONFigure:RXAFresp:MODGenerator:ENABle:TONE<nr>	*6.69*
CONFigure:RXAFresp:MODGenerator:FDEViation:FDMODe	*6.70*
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation	*6.71*
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation:TONE<nr>	*6.71*
CONFigure:RXAFresp:MODGenerator:FDEViation:TFDeviation	*6.71*
CONFigure:RXAFresp:MODGenerator:FREQuency	*6.70*
CONFigure:RXAFresp:MODGenerator:FREQuency:TONE<nr>	*6.70*
CONFigure:RXAFresp:TDEFinition	*6.68*
CONFigure:RXAFresp:TDEFinition:TONE<nr>	*6.68*
CONFigure:RXTests:AFANalyzer:CONTrol:DEFault	*6.45*
CONFigure:RXTests:AFANalyzer:CONTrol:REPetition	*6.45*

Command (Non Signalling, alphabetical)	**Page**
CONFigure:RXTests:AFANalyzer:EREPorting	*6.44*
CONFigure:RXTests:AFANalyzer:FILTer	*6.47*
CONFigure:RXTests:AFANalyzer:FILTer:DEFault	*6.47*
CONFigure:RXTests:AFANalyzer:LIMit	*6.46*
CONFigure:RXTests:AFANalyzer:LIMit:DEFault	*6.46*
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:DEFault	*6.50*
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:MTIMe	*6.50*
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:REPetition	*6.50*
CONFigure:RXTests:AFANalyzer:VMSinad:EREPorting	*6.49*
CONFigure:RXTests:HNOise:CONTrol:DEFault	*6.53*
CONFigure:RXTests:HNOise:CONTrol:REPetition	*6.53*
CONFigure:RXTests:HNOise:EREPorting	*6.52*
CONFigure:RXTests:HNOise:FILTer	*6.55*
CONFigure:RXTests:HNOise:FILTer:DEFault	*6.55*
CONFigure:RXTests:HNOise:LIMit	*6.54*
CONFigure:RXTests:HNOise:LIMit:DEFault	*6.54*
CONFigure:RXTests:SENSitivity:CONTrol:DEFault	*6.58*
CONFigure:RXTests:SENSitivity:CONTrol:TSERange	*6.58*
CONFigure:RXTests:SENSitivity:CONTrol:TSINad	*6.58*
CONFigure:RXTests:SENSitivity:EREPorting	*6.57*
CONFigure:RXTests:SENSitivity:FILTer	*6.60*
CONFigure:RXTests:SENSitivity:FILTer:DEFault	*6.60*
CONFigure:RXTests:SENSitivity:LIMit	*6.59*
CONFigure:RXTests:SENSitivity:LIMit:DEFault	*6.59*
CONFigure:SUBarrays:RXAFresp	*6.65*
CONFigure:SUBarrays:TXAFresp	*6.34*
CONFigure:TXAFresp:AFGenerator:ENABle	*6.38*
CONFigure:TXAFresp:AFGenerator:ENABle:TONE<nr>	*6.39*
CONFigure:TXAFresp:AFGenerator:FREQuency	*6.39*
CONFigure:TXAFresp:AFGenerator:FREQuency:TONE<nr>	*6.39*
CONFigure:TXAFresp:AFGenerator:LEVel:LMODe	*6.39*
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel	*6.40*
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel:TONE<nr>	*6.40*
CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel	*6.40*
CONFigure:TXAFresp:CONTrol:AFGenerator:DEFault	*6.41*
CONFigure:TXAFresp:CONTrol:AFGLead	*6.33*
CONFigure:TXAFresp:CONTrol:DEFault	*6.33*
CONFigure:TXAFresp:CONTrol:RDEViation	*6.32*
CONFigure:TXAFresp:CONTrol:REPetition	*6.32*
CONFigure:TXAFresp:CONTrol:RREQuest	*6.33*
CONFigure:TXAFresp:CONTrol:TDEFinition:DEFault	*6.38*
CONFigure:TXAFresp:EREPorting	*6.31*
CONFigure:TXAFresp:FILTer	*6.41*
CONFigure:TXAFresp:FILTer:DEFault	*6.42*
CONFigure:TXAFresp:LIMit[:LINE]:DEFault	*6.36*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	*6.36*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	*6.36*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	*6.35*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	*6.35*
CONFigure:TXAFresp:TDEFinition	*6.37*
CONFigure:TXAFresp:TDEFinition:TONE<nr>	*6.38*
CONFigure:TXTests:AFLSearch:CONTrol:DEFault	*6.27*
CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation	*6.27*
CONFigure:TXTests:AFLSearch:CONTrol:TDERange	*6.27*
CONFigure:TXTests:AFLSearch:EREPorting	*6.26*
CONFigure:TXTests:AFLSearch:FILTer	*6.29*
CONFigure:TXTests:AFLSearch:FILTer:DEFault	*6.29*

Command (Non Signalling, alphabetical) **Page**

CONFigure:TXTests:AFLSearch:LIMit 6.28
CONFigure:TXTests:AFLSearch:LIMit:DEFault 6.28
CONFigure:TXTests:HNOise:CONTrol:DEFault 6.22
CONFigure:TXTests:HNOise:CONTrol:REPetition 6.22
CONFigure:TXTests:HNOise:EREPorting 6.21
CONFigure:TXTests:HNOise:FILTer 6.24
CONFigure:TXTests:HNOise:FILTer:DEFault 6.24
CONFigure:TXTests:HNOise:LIMit 6.23
CONFigure:TXTests:HNOise:LIMit:DEFault 6.23
CONFigure:TXTests:MODulation:CONTrol:DEFault 6.17
CONFigure:TXTests:MODulation:CONTrol:REPetition 6.17
CONFigure:TXTests:MODulation:EREPorting 6.16
CONFigure:TXTests:MODulation:FILTer 6.19
CONFigure:TXTests:MODulation:FILTer:DEFault 6.19
CONFigure:TXTests:MODulation:LIMit 6.18
CONFigure:TXTests:MODulation:LIMit:DEFault 6.18
CONFigure:WPOWer:CONTrol:REPetition 6.14
CONFigure:WPOWer:EREPorting 6.14
CONTinue:RXAFresp 6.62
CONTinue:RXTests:AFANalyzer 6.44
CONTinue:RXTests:AFANalyzer:VMSinad 6.49
CONTinue:RXTests:HNOise 6.52
CONTinue:RXTests:SENSitivity 6.57
CONTinue:TXAFresp 6.31
CONTinue:TXTests:AFLSearch 6.26
CONTinue:TXTests:HNOise 6.21
CONTinue:TXTests:MODulation 6.16
CONTinue:WPOWer 6.13
DISPlay:RXAFresp:CONTrol:GRID 6.63
DISPlay:RXAFresp[:WINDow]:TRACe:Y:SCALe 6.64
DISPlay:TXAFresp:CONTrol:GRID 6.32
DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe 6.33
FETCh:AFGenerator:STATus? 6.7
FETCh:ARRay:RXAFresp[:RESult]? 6.73
FETCh:ARRay:TXAFresp[:RESult]? 6.42
FETCh:MODGenerator:STATus? 6.8
FETCh:RFGenerator:STATus? 6.5
FETCh:RXAFresp:STATus? 6.62
FETCh:RXTests:AFANalyzer:STATus? 6.44
FETCh:RXTests:AFANalyzer:VMSinad:STATus? 6.49
FETCh:RXTests:HNOise:STATus? 6.52
FETCh:RXTests:SENSitivity:STATus? 6.57
FETCh:SAT:STATus? 6.9
FETCh:ST:STATus? 6.10
FETCh:SUBarrays:RXAFresp[:RESult]? 6.73
FETCh:SUBarrays:TXAFresp[:RESult]? 6.43
FETCh:TXAFresp:STATus? 6.31
FETCh:TXTests:AFLSearch:STATus? 6.26
FETCh:TXTests:HNOise:STATus? 6.21
FETCh:TXTests:MODulation:STATus? 6.16
FETCh:WPOWer:STATus? 6.14
FETCh[:SCALar]:RXAFresp[:RESult]:TONE<nr>? 6.73
FETCh[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]? 6.51
FETCh[:SCALar]:RXTests:AFANalyzer[:RESult]? 6.48
FETCh[:SCALar]:RXTests:HNOise[:RESult]? 6.56
FETCh[:SCALar]:RXTests:SENSitivity[:RESult]? 6.61
FETCh[:SCALar]:TXAFresp[:RESult]:TONE<nr>? 6.42

Command (Non Signalling, alphabetical)	**Page**
FETCh[:SCALar]:TXTests:AFLSearch[:RESult]?	*6.30*
FETCh[:SCALar]:TXTests:HNOise[:RESult]?	*6.25*
FETCh[:SCALar]:TXTests:MODulation[:RESult]?	*6.20*
FETCh[:SCALar]:WPOWer[:RESult]?	*6.15*
INITiate:AFGenerator	*6.7*
INITiate:MODGenerator	*6.8*
INITiate:RFGenerator	*6.5*
INITiate:RXAFresp	*6.62*
INITiate:RXTests:AFANalyzer	*6.44*
INITiate:RXTests:AFANalyzer:VMSinad	*6.49*
INITiate:RXTests:HNOise	*6.52*
INITiate:RXTests:SENSitivity	*6.57*
INITiate:SAT	*6.9*
INITiate:ST	*6.10*
INITiate:TXAFresp	*6.31*
INITiate:TXTests:AFLSearch	*6.26*
INITiate:TXTests:HNOise	*6.21*
INITiate:TXTests:MODulation	*6.16*
INITiate:WPOWer	*6.13*
INPut[:STATe]	*6.11*
OUTPut[:STATe]	*6.11*
READ:ARRay:RXAFresp[:RESult]?	*6.73*
READ:ARRay:TXAFresp[:RESult]?	*6.42*
READ:SUBarrays:RXAFresp[:RESult]?	*6.73*
READ:SUBarrays:TXAFresp[:RESult]?	*6.43*
READ[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	*6.73*
READ[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	*6.51*
READ[:SCALar]:RXTests:AFANalyzer[:RESult]?	*6.48*
READ[:SCALar]:RXTests:HNOise[:RESult]?	*6.56*
READ[:SCALar]:RXTests:SENSitivity[:RESult]?	*6.61*
READ[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	*6.42*
READ[:SCALar]:TXTests:AFLSearch[:RESult]?	*6.30*
READ[:SCALar]:TXTests:HNOise[:RESult]?	*6.25*
READ[:SCALar]:TXTests:MODulation[:RESult]?	*6.20*
READ[:SCALar]:WPOWer[:RESult]?	*6.15*
SAMPle:ARRay:RXAFresp[:RESult]?	*6.73*
SAMPle:ARRay:TXAFresp[:RESult]?	*6.42*
SAMPle:SUBarrays:RXAFresp[:RESult]?	*6.73*
SAMPle:SUBarrays:TXAFresp[:RESult]?	*6.43*
SAMPle[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	*6.73*
SAMPle[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	*6.51*
SAMPle[:SCALar]:RXTests:AFANalyzer[:RESult]?	*6.48*
SAMPle[:SCALar]:RXTests:HNOise[:RESult]?	*6.56*
SAMPle[:SCALar]:RXTests:SENSitivity[:RESult]?	*6.61*
SAMPle[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	*6.42*
SAMPle[:SCALar]:TXTests:AFLSearch[:RESult]?	*6.30*
SAMPle[:SCALar]:TXTests:HNOise[:RESult]?	*6.25*
SAMPle[:SCALar]:TXTests:MODulation[:RESult]?	*6.20*
SAMPle[:SCALar]:WPOWer[:RESult]?	*6.15*
[SENSe:]AFLevel:DEFault	*6.3*
[SENSe:]AFLevel:MAXimum	*6.3*
[SENSe:]AFLevel:MODE	*6.3*
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	*6.11*
[SENSe:]CORRection:LOSS:OUTput<nr>[:MAGNitude]	*6.11*
[SENSe:]LEVel:ATTenuation	*6.2*
[SENSe:]LEVel:DEFault	*6.2*
[SENSe:]LEVel:MAXimum	*6.2*

Command (Non Signalling, alphabetical) **Page**

[SENSe:]LEVel:MODE *6.1*
[SENSe:]RFANalyzer:FREQuency *6.4*
[SENSe:]RFANalyzer:FREQuency:OFFSet *6.4*
[SENSe:]RFANalyzer:FREQuency:UNIT *6.4*
SOURce:AFGenerator:FREQuency *6.7*
SOURce:AFGenerator:LEVel *6.7*
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude] *6.11*
SOURce:CORRection:LOSS:OUTput<nr>[:MAGNitude] *6.11*
SOURce:DM:CLOCk:FREQuency *6.12*
SOURce:DM:CLOCk:STATe *6.12*
SOURce:MODGenerator:DEViation *6.8*
SOURce:MODGenerator:FREQuency *6.8*
SOURce:RFGenerator:FREQuency *6.6*
SOURce:RFGenerator:FREQuency:OFFSet *6.6*
SOURce:RFGenerator:FREQuency:UNIT *6.6*
SOURce:RFGenerator:LEVel *6.5*
SOURce:SAT:PEAKdev *6.9*
SOURce:SAT:SCC *6.9*
SOURce:ST:DAT *6.10*
SOURce:ST:PEAKdev *6.10*
STOP:RXAFresp *6.62*
STOP:RXTests:AFANalyzer *6.44*
STOP:RXTests:AFANalyzer:VMSinad *6.49*
STOP:RXTests:HNOise *6.52*
STOP:RXTests:SENSitivity *6.57*
STOP:TXAFresp *6.31*
STOP:TXTests:AFLSearch *6.26*
STOP:TXTests:HNOise *6.21*
STOP:TXTests:MODulation *6.16*
STOP:WPOWer *6.13*

Table 6-4 Remote-control commands: *Signalling* mode

Command (Signalling, alphabetical)	***Page***
ABORt:AFGenerator	*6.92*
ABORt:MODGenerator	*6.93*
ABORt:RXAFresp	*6.62*
ABORt:RXTests:AFANalyzer	*6.44*
ABORt:RXTests:AFANalyzer:VMSinad	*6.49*
ABORt:RXTests:HNOise	*6.52*
ABORt:RXTests:SENSitivity	*6.57*
ABORt:TXAFresp	*6.31*
ABORt:TXTests:AFLSearch	*6.26*
ABORt:TXTests:HNOise	*6.21*
ABORt:TXTests:MODulation	*6.16*
ABORt:WPOWer	*6.13*
CALCulate:ARRay:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE?	*6.74*
CALCulate:ARRay:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]?	*6.43*
CALCulate[:SCALar]:RXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	*6.74*
CALCulate[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]:MATChing:LIMit?	*6.51*
CALCulate[:SCALar]:RXTests:AFANalyzer[:RESult]:MATChing:LIMit?	*6.48*
CALCulate[:SCALar]:RXTests:HNOise[:RESult]:MATChing:LIMit?	*6.56*
CALCulate[:SCALar]:RXTests:SENSitivity[:RESult]:MATChing:LIMit?	*6.61*
CALCulate[:SCALar]:TXAFresp[:RESult]:MATChing:LIMit[:LINE][:ASYMmetrical][:COMBined]:TONE<nr>?	*6.43*
CALCulate[:SCALar]:TXTests:AFLSearch[:RESult]:MATChing?	*6.30*
CALCulate[:SCALar]:TXTests:HNOise[:RESult]:MATChing:LIMit?	*6.25*
CALCulate[:SCALar]:TXTests:MODulation[:RESult]:MATChing:LIMit?	*6.20*
CONFigure:BSSignal:ACC:CHANnel	*6.82*
CONFigure:BSSignal:ACC:LEVel	*6.82*
CONFigure:BSSignal:OCHandoff:SAT:PEAKdev	*6.84*
CONFigure:BSSignal:OCHandoff:SAT:SCC	*6.84*
CONFigure:BSSignal:OCHandoff[:AVC]:CHANnel	*6.83*
CONFigure:BSSignal:OCHandoff[:AVC]:LEVel	*6.84*
CONFigure:BSSignal:SAT:PEAKdev	*6.83*
CONFigure:BSSignal:SAT:SCC	*6.83*
CONFigure:BSSignal[:AVC]:CHANnel	*6.82*
CONFigure:BSSignal[:AVC]:LEVel	*6.83*
CONFigure:HANDoff:TARGet	*6.82*
CONFigure:NETWork:IDENtity:DCC	*6.85*
CONFigure:NETWork:IDENtity:SID1	*6.85*
CONFigure:NETWork:OCHandoff[:MS]:VMAC	*6.88*
CONFigure:NETWork:REQuest:SNUMber	*6.86*
CONFigure:NETWork:SMODe:IDMin	*6.86*
CONFigure:NETWork:SMODe:REGH	*6.85*
CONFigure:NETWork:SMODe:REGR	*6.85*
CONFigure:NETWork:TIMeout:LORLINk	*6.87*
CONFigure:NETWork:TIMeout:RPERiod	*6.87*
CONFigure:NETWork[:MS]:CMAC	*6.86*
CONFigure:NETWork[:MS]:RCFM	*6.87*
CONFigure:NETWork[:MS]:VMAC	*6.86*
CONFigure:OCALl:TARGet	*6.81*
CONFigure:RXAFresp:CONTrol:AFGLead	*6.64*
CONFigure:RXAFresp:CONTrol:DEFault	*6.64*
CONFigure:RXAFresp:CONTrol:MODGenerator:DEFault	*6.71*
CONFigure:RXAFresp:CONTrol:REPetition	*6.63*
CONFigure:RXAFresp:CONTrol:RLEVel	*6.63*
CONFigure:RXAFresp:CONTrol:RREQuest	*6.64*
CONFigure:RXAFresp:CONTrol:TDEFinition	*6.69*
CONFigure:RXAFresp:EREPorting	*6.62*

Command (Signalling, alphabetical)	Page
CONFigure:RXAFresp:FILTer	6.72
CONFigure:RXAFresp:FILTer:DEFault	6.72
CONFigure:RXAFresp:LIMit[:LINE]:DEFault	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	6.67
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	6.66
CONFigure:RXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	6.66
CONFigure:RXAFresp:MODGenerator:ENABle	6.69
CONFigure:RXAFresp:MODGenerator:ENABle:TONE<nr>	6.69
CONFigure:RXAFresp:MODGenerator:FDEViation:FDMODe	6.70
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation	6.71
CONFigure:RXAFresp:MODGenerator:FDEViation:SFDeviation:TONE<nr>	6.71
CONFigure:RXAFresp:MODGenerator:FDEViation:TFDeviation	6.71
CONFigure:RXAFresp:MODGenerator:FREQuency	6.70
CONFigure:RXAFresp:MODGenerator:FREQuency:TONE<nr>	6.70
CONFigure:RXAFresp:TDEFinition	6.68
CONFigure:RXAFresp:TDEFinition:TONE<nr>	6.68
CONFigure:RXTests:AFANalyzer:CONTrol:DEFault	6.45
CONFigure:RXTests:AFANalyzer:CONTrol:REPetition	6.45
CONFigure:RXTests:AFANalyzer:EREPorting	6.44
CONFigure:RXTests:AFANalyzer:FILTer	6.47
CONFigure:RXTests:AFANalyzer:FILTer:DEFault	6.47
CONFigure:RXTests:AFANalyzer:LIMit	6.46
CONFigure:RXTests:AFANalyzer:LIMit:DEFault	6.46
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:DEFault	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:MTIMe	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:CONTrol:REPetition	6.50
CONFigure:RXTests:AFANalyzer:VMSinad:EREPorting	6.49
CONFigure:RXTests:HNOise:CONTrol:DEFault	6.53
CONFigure:RXTests:HNOise:CONTrol:REPetition	6.53
CONFigure:RXTests:HNOise:EREPorting	6.52
CONFigure:RXTests:HNOise:FILTer	6.55
CONFigure:RXTests:HNOise:FILTer:DEFault	6.55
CONFigure:RXTests:HNOise:LIMit	6.54
CONFigure:RXTests:HNOise:LIMit:DEFault	6.54
CONFigure:RXTests:SENSitivity:CONTrol:DEFault	6.58
CONFigure:RXTests:SENSitivity:CONTrol:TSERange	6.58
CONFigure:RXTests:SENSitivity:CONTrol:TSINad	6.58
CONFigure:RXTests:SENSitivity:EREPorting	6.57
CONFigure:RXTests:SENSitivity:FILTer	6.60
CONFigure:RXTests:SENSitivity:FILTer:DEFault	6.60
CONFigure:RXTests:SENSitivity:LIMit	6.59
CONFigure:RXTests:SENSitivity:LIMit:DEFault	6.59
CONFigure:SUBarrays:RXAFresp	6.65
CONFigure:SUBarrays:TXAFresp	6.34
CONFigure:TXAFresp:AFGenerator:ENABle	6.38
CONFigure:TXAFresp:AFGenerator:ENABle:TONE<nr>	6.39
CONFigure:TXAFresp:AFGenerator:FREQuency	6.39
CONFigure:TXAFresp:AFGenerator:FREQuency:TONE<nr>	6.39
CONFigure:TXAFresp:AFGenerator:LEVel:LMODe	6.39
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel	6.40
CONFigure:TXAFresp:AFGenerator:LEVel:SLEVel:TONE<nr>	6.40
CONFigure:TXAFresp:AFGenerator:LEVel:TLEVel	6.40
CONFigure:TXAFresp:CONTrol:AFGenerator:DEFault	6.41
CONFigure:TXAFresp:CONTrol:AFGLead	6.33
CONFigure:TXAFresp:CONTrol:DEFault	6.33
CONFigure:TXAFresp:CONTrol:RDEViation	6.32

Command (Signalling, alphabetical)	*Page*
CONFigure:TXAFresp:CONTrol:REPetition	*6.32*
CONFigure:TXAFresp:CONTrol:RREQuest	*6.33*
CONFigure:TXAFresp:CONTrol:TDEFinition:DEFault	*6.38*
CONFigure:TXAFresp:EREPorting	*6.31*
CONFigure:TXAFresp:FILTer	*6.41*
CONFigure:TXAFresp:FILTer:DEFault	*6.42*
CONFigure:TXAFresp:LIMit[:LINE]:DEFault	*6.36*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	*6.36*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:LOWer	*6.36*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	*6.35*
CONFigure:TXAFresp:LIMit[:LINE][:ASYMmetrical]:UPPer	*6.35*
CONFigure:TXAFresp:TDEFinition	*6.37*
CONFigure:TXAFresp:TDEFinition:TONE<nr>	*6.38*
CONFigure:TXTests:AFLSearch:CONTrol:DEFault	*6.27*
CONFigure:TXTests:AFLSearch:CONTrol:TAPDeviation	*6.27*
CONFigure:TXTests:AFLSearch:CONTrol:TDERange	*6.27*
CONFigure:TXTests:AFLSearch:EREPorting	*6.26*
CONFigure:TXTests:AFLSearch:FILTer	*6.29*
CONFigure:TXTests:AFLSearch:FILTer:DEFault	*6.29*
CONFigure:TXTests:AFLSearch:LIMit	*6.28*
CONFigure:TXTests:AFLSearch:LIMit:DEFault	*6.28*
CONFigure:TXTests:HNOise:CONTrol:DEFault	*6.22*
CONFigure:TXTests:HNOise:CONTrol:REPetition	*6.22*
CONFigure:TXTests:HNOise:EREPorting	*6.21*
CONFigure:TXTests:HNOise:FILTer	*6.24*
CONFigure:TXTests:HNOise:FILTer:DEFault	*6.24*
CONFigure:TXTests:HNOise:LIMit	*6.23*
CONFigure:TXTests:HNOise:LIMit:DEFault	*6.23*
CONFigure:TXTests:MODulation:CONTrol:DEFault	*6.17*
CONFigure:TXTests:MODulation:CONTrol:REPetition	*6.17*
CONFigure:TXTests:MODulation:EREPorting	*6.16*
CONFigure:TXTests:MODulation:FILTer	*6.19*
CONFigure:TXTests:MODulation:FILTer:DEFault	*6.19*
CONFigure:TXTests:MODulation:LIMit	*6.18*
CONFigure:TXTests:MODulation:LIMit:DEFault	*6.18*
CONFigure:WPOWer:CONTrol:REPetition	*6.14*
CONFigure:WPOWer:EREPorting	*6.14*
CONTinue:RXAFresp	*6.62*
CONTinue:RXTests:AFANalyzer	*6.44*
CONTinue:RXTests:AFANalyzer:VMSinad	*6.49*
CONTinue:RXTests:HNOise	*6.52*
CONTinue:RXTests:SENSitivity	*6.57*
CONTinue:TXAFresp	*6.31*
CONTinue:TXTests:AFLSearch	*6.26*
CONTinue:TXTests:HNOise	*6.21*
CONTinue:TXTests:MODulation	*6.16*
CONTinue:WPOWer	*6.13*
DISPlay:RXAFresp:CONTrol:GRID	*6.63*
DISPlay:RXAFresp[:WINDow]:TRACe:Y:SCALe	*6.64*
DISPlay:TXAFresp:CONTrol:GRID	*6.32*
DISPlay:TXAFresp[:WINDow]:TRACe:Y:SCALe	*6.33*
FETCh:AFGenerator:STATus?	*6.92*
FETCh:ARRay:RXAFresp[:RESult]?	*6.73*
FETCh:ARRay:TXAFresp[:RESult]?	*6.42*
FETCh:MODGenerator:STATus?	*6.93*
FETCh:RXAFresp:STATus?	*6.62*
FETCh:RXTests:AFANalyzer:STATus?	*6.44*

Command (Signalling, alphabetical)	*Page*
FETCh:RXTests:AFANalyzer:VMSinad:STATus?	*6.49*
FETCh:RXTests:HNOise:STATus?	*6.52*
FETCh:RXTests:SENSitivity:STATus?	*6.57*
FETCh:SUBarrays:RXAFresp[:RESult]?	*6.73*
FETCh:SUBarrays:TXAFresp[:RESult]?	*6.43*
FETCh:TXAFresp:STATus?	*6.31*
FETCh:TXTests:AFLSearch:STATus?	*6.26*
FETCh:TXTests:HNOise:STATus?	*6.21*
FETCh:TXTests:MODulation:STATus?	*6.16*
FETCh:WPOWer:STATus?	*6.14*
FETCh[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	*6.73*
FETCh[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	*6.51*
FETCh[:SCALar]:RXTests:AFANalyzer[:RESult]?	*6.48*
FETCh[:SCALar]:RXTests:HNOise[:RESult]?	*6.56*
FETCh[:SCALar]:RXTests:SENSitivity[:RESult]?	*6.61*
FETCh[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	*6.42*
FETCh[:SCALar]:TXTests:AFLSearch[:RESult]?	*6.30*
FETCh[:SCALar]:TXTests:HNOise[:RESult]?	*6.25*
FETCh[:SCALar]:TXTests:MODulation[:RESult]?	*6.20*
FETCh[:SCALar]:WPOWer[:RESult]?	*6.15*
INITiate:AFGenerator	*6.92*
INITiate:MODGenerator	*6.93*
INITiate:RXAFresp	*6.62*
INITiate:RXTests:AFANalyzer	*6.44*
INITiate:RXTests:AFANalyzer:VMSinad	*6.49*
INITiate:RXTests:HNOise	*6.52*
INITiate:RXTests:SENSitivity	*6.57*
INITiate:TXAFresp	*6.31*
INITiate:TXTests:AFLSearch	*6.26*
INITiate:TXTests:HNOise	*6.21*
INITiate:TXTests:MODulation	*6.16*
INITiate:WPOWer	*6.13*
INPut[:STATe]	*6.88*
OUTPut[:STATe]	*6.88*
PROCedure:BSSignal[:AVC]:LEVel	*6.83*
PROCedure:SIGNalling:ACTion	*6.78*
PROCedure:SIGNalling[:AVC]:CHANnel	*6.79*
PROCedure:SIGNalling[:AVC]:MAC	*6.80*
PROCedure:SIGNalling[:AVC]:SAT:PEAKdev	*6.80*
PROCedure:SIGNalling[:AVC]:SAT:SCC	*6.80*
READ:ARRay:RXAFresp[:RESult]?	*6.73*
READ:ARRay:TXAFresp[:RESult]?	*6.42*
READ:SUBarrays:RXAFresp[:RESult]?	*6.73*
READ:SUBarrays:TXAFresp[:RESult]?	*6.43*
READ[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	*6.73*
READ[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	*6.51*
READ[:SCALar]:RXTests:AFANalyzer[:RESult]?	*6.48*
READ[:SCALar]:RXTests:HNOise[:RESult]?	*6.56*
READ[:SCALar]:RXTests:SENSitivity[:RESult]?	*6.61*
READ[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	*6.42*
READ[:SCALar]:TXTests:AFLSearch[:RESult]?	*6.30*
READ[:SCALar]:TXTests:HNOise[:RESult]?	*6.25*
READ[:SCALar]:TXTests:MODulation[:RESult]?	*6.20*
READ[:SCALar]:WPOWer[:RESult]?	*6.15*
SAMPle:ARRay:RXAFresp[:RESult]?	*6.73*
SAMPle:ARRay:TXAFresp[:RESult]?	*6.42*
SAMPle:SUBarrays:RXAFresp[:RESult]?	*6.73*

Command (Signalling, alphabetical)	*Page*
SAMPle:SUBarrays:TXAFresp[:RESult]?	*6.43*
SAMPle[:SCALar]:RXAFresp[:RESult]:TONE<nr>?	*6.73*
SAMPle[:SCALar]:RXTests:AFANalyzer:VMSinad[:RESult]?	*6.51*
SAMPle[:SCALar]:RXTests:AFANalyzer[:RESult]?	*6.48*
SAMPle[:SCALar]:RXTests:HNOise[:RESult]?	*6.56*
SAMPle[:SCALar]:RXTests:SENSitivity[:RESult]?	*6.61*
SAMPle[:SCALar]:TXAFresp[:RESult]:TONE<nr>?	*6.42*
SAMPle[:SCALar]:TXTests:AFLSearch[:RESult]?	*6.30*
SAMPle[:SCALar]:TXTests:HNOise[:RESult]?	*6.25*
SAMPle[:SCALar]:TXTests:MODulation[:RESult]?	*6.20*
SAMPle[:SCALar]:WPOWer[:RESult]?	*6.15*
[SENSe:]AFLevel:DEFault	*6.77*
[SENSe:]AFLevel:MAXimum	*6.77*
[SENSe:]AFLevel:MODE	*6.76*
[SENSe:]CORRection:LOSS:INPut<nr>[:MAGNitude]	*6.89*
[SENSe:]CORRection:LOSS:Output<nr>[:MAGNitude]	*6.89*
[SENSe:]LEVel:ATTenuation	*6.76*
[SENSe:]LEVel:DEFault	*6.76*
[SENSe:]LEVel:MAXimum	*6.76*
[SENSe:]LEVel:MODE	*6.75*
[SENSe:]MSSinfo:BANDwidth?	*6.90*
[SENSe:]MSSinfo:DNUMber?	*6.91*
[SENSe:]MSSinfo:MIN[:NUMBer]?	*6.90*
[SENSe:]MSSinfo:MPCI?	*6.91*
[SENSe:]MSSinfo:PCLass?	*6.90*
[SENSe:]MSSinfo:SN?	*6.90*
[SENSe:]SIGNalling:STATe?	*6.79*
SOURce:AFGenerator:FREQuency	*6.92*
SOURce:AFGenerator:LEVel	*6.92*
SOURce:CORRection:LOSS:INPut<nr>[:MAGNitude]	*6.89*
SOURce:CORRection:LOSS:Output<nr>[:MAGNitude]	*6.89*
SOURce:DM:CLOCk:FREQuency	*6.89*
SOURce:DM:CLOCk:STATe	*6.89*
SOURce:MODGenerator:Deviation	*6.93*
SOURce:MODGenerator:FREQuency	*6.93*
STATus:HANDoff:TARGet:LIST?	*6.81*
STATus:OCALl:TARGet:LIST?	*6.81*
STOP:RXAFresp	*6.62*
STOP:RXTests:AFANalyzer	*6.44*
STOP:RXTests:AFANalyzer:VMSinad	*6.49*
STOP:RXTests:HNOise	*6.52*
STOP:RXTests:SENSitivity	*6.57*
STOP:TXAFresp	*6.31*
STOP:TXTests:AFLSearch	*6.26*
STOP:TXTests:HNOise	*6.21*
STOP:TXTests:MODulation	*6.16*
STOP:WPOWer	*6.13*
UNIT:CHANnel	*6.75*

Index

A

- Address (secondary) 5.1
- AF Analyzer
  - Analyzer/Generator 4.3
  - RX Tests 4.25
- AF Distortion 4.28
- AF frequency 6.7, 6.92
- AF Generator 4.3
  - remote control (NS) 6.7
  - remote control (Sig) 6.92
  - RX Tests 4.27
  - TX Tests 4.7
- AF Generator Lead 4.21
  - remote control (RX) 6.64
  - remote control (TX) 6.33
- AF Input Ref. Level 4.35
- AF Level
  - remote control (NS) 6.3
- AF Level Search 4.6
  - remote control 6.27
- AF Max. Level
  - Non Signalling 4.49, 6.3
  - RX Audio Freq. Response 4.34
  - RX Tests 4.27
  - Signalling 4.79, 6.77
- AF Search Level 4.9
- AF SINAD 4.28
- AF Voltage 6.7, 6.92
- AF Voltmeter 4.28
- AF Voltmeter Min./Max. 6.59
- AF/RF (table) 4.53
- Alerting 4.51
- Analyzer Settings (panel) 4.39
- Analyzer/Generator 4.2
- Application 3.5
- Application (softkey)
  - RX Tests 4.25
  - TX Tests 4.6
- Attenuation 6.2, 6.76
  - input level 4.49
  - output level 4.44
  - TX Audio Freq. Response 4.17
  - TX Tests, Non Signalling 4.7
  - TX Tests, Signalling 4.60
- Audio Peak Deviation 4.9
- Autoranging
  - Group Config 4.79
  - Group Config. 4.48

B

- Band Pass 4.14
- Bandwidth 6.90
- Braces 5.7
- BS Signal 2.17
  - menu 4.73
  - remote control 6.82
  - Signalling 4.53, 4.68
- BS Signal Parameter 4.74
- BS Signal Settings 4.40

C

- Call Established 4.51
- Call from MS 4.51
- Call Pending 4.72
- Call Release 4.67
- Call to MS 4.51
  - Other Call 4.71
- Carrier Frequency Error 4.9
- Carrier Power 4.9
- CCITT weighting filter 4.14
- Channel Units 6.75
- CMAC 4.77, 6.86
- C-message weighted filter 4.14
- Command
  - order 5.1, 5.6
  - structure 5.1
  - tables (description) 5.6
- Configurations 3.2
- Connect mobile phone 2.2
- Connection Control
  - Non Signalling 4.38
  - remote control (NS) 6.4
  - remote control (Sig) 6.78
  - Signalling 4.51, 4.64
- Connectors (RF) 2.3
- Continuous 4.11, 5.3
- Control (AF Generator)
  - RX Tests 4.27
  - TX Tests 4.7
- Control (Mod. Generator) 4.27
- Control Channel (CC) 4.74, 6.82
- Counting 5.3
- Current values 4.58, 6.78

D

- Data 4.43, 6.10
- DCC 4.76, 6.85
- De-emphasis 4.14
- Default 4.11
- Default MIN 4.77
- Default values 4.58, 6.78
- Destination Defaults
  - Handoff 4.73
  - Other Call 4.71
- Destination Parameter
  - Handoff 4.72
  - Other Call 4.70
- Destination Selection 6.81, 6.82
  - Handoff 4.72
  - Other Call 4.70
- Deviation 4.28
- Deviation Selection 6.70
- Dialed number 4.69
- Dialled Number 6.91
- Duplex spacing 4.41
- Dynamic power control 2.19
- Dynamic range 4.49

E

- Enable software 1.2
- Expandor 4.14
- Ext. Att. Input 4.45, 6.11, 6.89
- Ext. Att. Output 4.44, 6.11, 6.89
- External attenuation 4.44
  - remote control (NS) 6.11

F

- Filter
  - RX Audio Freq. Configuration ... 4.37
  - RX Audio Freq. Response ... 6.72
  - RX Tests ... 4.32
  - RXTests – AF Analyzer ... 6.47
  - TX Audio Freq. Response ... 4.23
  - TX Audio Freq. Response ... 6.41
  - TX Tests ... 4.13
  - TXTests – AF Level Search ... 6.29
  - TXTests – Hum & Noise ... 6.24
  - TXTests – Modulation ... 6.19
- Force ST ... 4.60, 4.69, 6.78
- Freq./Dev. (RX Audio Freq. Response) ... 4.37
- Frequency
  - RX Tests ... 4.26
  - ST ... 4.43
  - TX Audio Freq. Response ... 4.18
  - TX Tests ... 4.6, 4.60
- Frequency Offset ... 4.40
  - generator ... 4.42
- Frequency Unit ... 6.4, 6.6
- Function group
  - AMPS-MS Non Signalling ... 4.2
  - AMPS-MS Signalling ... 4.51

G

- Gain ... 4.44
- Generator
  - AF ... 4.3
  - Mod. ... 4.3
  - RF (frequency) ... 4.41
  - RF (level) ... 4.40
- Getting Started ... 2.1
- Grid
  - RX Audio Freq. Response ... 6.63
  - TX Audio Freq. Response ... 6.32
- Group Configuration
  - Non Signalling ... 4.48
  - remote control (NS) ... 6.1
  - Remote Control (Sig) ... 6.75
  - Signalling ... 4.79

H

- Handoff ... 4.71
  - remote control ... 6.81
  - softkey ... 4.73
- HLT state ... 2.9
- Home Registration ... 6.85
- Hotkey ... 2.11
- Hum & Noise
  - definition (RX Tests) ... 4.29
  - definition (TX Tests) ... 4.9
  - RX Tests ... 4.26
  - TX Tests ... 4.6

I

- Input Level
  - Non Signalling ... 4.48
  - remote control (NS) ... 6.1
  - remote control (Sig) ... 6.75, 6.76
  - RX Audio Freq. Response ... 4.34
  - RX Tests ... 4.27
  - Signalling ... 4.60, 4.79
  - TX Audio Freq. Response ... 4.17
  - TX Tests ... 4.7, 4.60
- Inputs/outputs
  - Non Signalling ... 4.44
  - remote control ... 6.88
  - Signalling ... 4.78
- Installation (software) ... 1.1
- Intermodulation ... 4.49
- INV ... 5.7

L

- Level
  - RX Tests ... 4.27
  - TX Tests ... 4.7
- Level Handling ... 4.22
- Level Selection ... 4.22, 6.39
- Limit
  - check ... 5.4
  - lines ... 5.4
  - specify ... 5.4
- Limit lines
  - RX Audio Freq. Response ... 4.37
  - TX Audio Freq. Response ... 4.21, 4.37
- Limit Matching
  - RX Audio Freq. Response ... 6.74
  - RX Tests – AF Analyzer ... 6.48, 6.51
  - RX Tests – Hum & Noise ... 6.56
  - RX Tests – Sensitivity ... 6.61
  - TX Audio Freq. Response ... 6.43
  - TX Tests – AF Level Search ... 6.30
  - TX Tests – Hum & Noise ... 6.25
  - TX Tests – Modulation ... 6.20
- Limits
  - RX Audio Freq. Response ... 6.66
  - RX Tests – AF Analyzer ... 6.46
  - RX Tests – Hum & Noise ... 6.54
  - RX Tests – Sensitivity ... 6.59
  - RX Tests, Non Signalling ... 4.31
  - RXTests – AF Analyzer ... 6.46
  - RXTests – Hum & Noise ... 6.54, 6.55
  - RXTests – Sensitivity ... 6.59, 6.60
  - TX Audio Freq. Response ... 6.35
  - TX Tests – AF Level Search ... 6.28
  - TX Tests – Hum & Noise ... 6.23
  - TX Tests – Modulation ... 6.18
  - TX Tests, Non Signalling ... 4.12
  - TXTests – AF Level Search ... 6.28
  - TXTests – Hum & Noise ... 6.23
  - TXTests – Modulation ... 6.18
- List of Commands ... 6.94
  - alphabetical ... 6.110
  - description ... 5.8
- Literal ... 5.7
- Loss of Radio Link ... 6.87
- Low distortion ... 4.49
- Low noise ... 4.49
- Lower Limit Line
  - RX Audio Freq. Response ... 6.67
  - TX Audio Freq. Response ... 4.21
  - TX Audio Freq. Response ... 6.36

M

- Mains switch ... 2.2
- Manual control ... 3.1
- Max. Level ... **6.2**, 6.76
  - Analyzer/Generator ... 4.39
  - Group Config. ... 4.48
- Measurement control ... 5.2
- Measurement groups ... 3.3
- Measurement object ... 5.6
- Menu Select ... 2.4, 2.16
- Menu structure ... 3.1

- MIN 6.86, 6.90
- Mobile Info 4.65, 4.69
- Mobile phone
  - connection 2.2
- Mobile Settings 4.77
- Mobile tests 4.51
- Mod. Deviation 6.8, 6.93
- Mod. Dist. & Noise 4.9
- Mod. frequency 6.8, 6.93
- Mod. Generator 4.3
  - remote control (NS) 6.8
  - remote control (Sig) 6.93
  - RX Tests 4.27
- Mode
  - Non Signalling 4.48
- Mode (AF level)
  - remote control (NS) 6.3
  - remote control (Sig) 6.76
- Mode (input level)
  - remote control (NS) 6.1
  - remote control (Sig) 6.75
  - Signalling 4.79
- Modulation (TX Tests) 4.6
- Modulation Generator 6.8, 6.93
- MPCI 6.91

N

- NAN 5.7
- Network (table) 4.53
- Network Identity 4.76
- Network Parameter 4.76
  - remote control 6.85
- Network tab 4.75
- Non Signalling 3.1, 4.2
- Non signalling measurements 2.6
- Notation (remote control) 5.6

O

- Offset
  - RX Tests 4.26
  - TX Tests 4.7
- Operating concept 3.1
- OPERation status register 5.5
- Origin Parameter
  - Handoff 4.73
  - Other Call 4.71
- Other Call 4.69
  - remote control 6.81
- Other Call/Handoff
  - RF Channel 6.83
  - RF Level 6.84
  - VMAC 6.88
- Other Call/Handoff Parameter 4.74, 4.78, 6.88
- Overview 4.57

P

- Parameter
  - current vs. default 4.58, 6.78
  - in SCPI command 5.7
- Path Configuration
  - RX Audio Freq. Response 6.72
  - RX Tests – AF Analyzer 6.47, 6.55, 6.60
  - TX Audio Freq. Response 6.41
  - TX Tests 4.13, 4.23, 4.32, 4.37
  - TX Tests – Hum & Noise 6.29
  - TX Tests – Modulation 6.19, 6.24
- PCL level 2.19
- Peak Deviation
  - SAT 6.9
  - SAT (Call Established) 4.68
  - SAT (Connection Control) 4.42
  - ST 4.43, 6.10
- Power (wide band)
  - remote control 6.13
  - Signalling 4.53
- Power Class 6.90
- Power Level 4.40, 6.5
  - RX Tests 4.26
- Power Lvl./Voice Ch. 4.26
- Power switch 2.3
- Pre-emphasis 4.14
- Pseudo measurement object 5.6

R

- Read Control Filler Message 6.87
- Read Control Filter Msg. 4.77
- REF OUT 2 4.47, 6.12, 6.89
- Reference Deviation 4.18, 6.32
- Reference Frequency
  - Non Signalling 4.46
  - remote control (NS) 6.12
  - remote control (Sig) 6.89
  - Signalling 4.78
- Reference Level 6.63
- Reference part 4.1
- Reg. Pending 4.70
- Registered 4.51
- Registration 4.76
- Registration Period 6.87
- Remote control
  - basics 5.1
  - commands 6.1
  - notation 5.6
- Repetition 4.11
  - AF Analyzer 6.45, 6.50
  - Hum & Noise 6.22, 6.53
  - Modulation 6.17
  - RX Audio Freq. Response 6.63
  - TX Audio Freq. Response 6.32
- Repetition mode 3.5, 5.3
- Requested Mobile Data 4.77
- Residual AM 4.9
- Result
  - RX Tests 4.35
  - TX Tests 4.18
- Result (RX Audio Freq. Response)
  - Non Signalling 4.35
  - remote control 6.73
- Result (RX Tests)
  - Non Signalling 4.28
  - remote control 6.48, 6.51, 6.56, 6.61
- Result (TX Audio Freq. Response)
  - Non Signalling 4.19
  - remote control 6.42
- Result (TX Tests)
  - Non Signalling 4.8
  - remote control 6.20, 6.25, 6.30
- RF Analyzer
  - remote control (NS) 6.4
- RF carrier signals 2.17
- RF Channel 6.4
- RF connector 2.2
- RF connectors 2.3
- RF generator
  - remote control (NS) 6.5
- RF Generator 6.5, 6.9, 6.10
- RF Input 4.45, 6.11, 6.88
- RF Max. Level 4.17

Non Signalling 4.49
Signalling 4.79
RF Output 4.44, 6.11, 6.88
Roaming Registration 6.85
RX Audio Freq. Response
  Non Signalling 4.33
  remote control 6.62
  Signalling 4.63
RX Audio Freq. Response (control)
  Non Signalling 4.37
  remote control 6.63
RX Audio Freq. Response (trace)
  remote control 6.73
RX Audio Freq. Response Configuration
  Non Signalling 4.37
  remote control 6.63
RX Tests
  Non Signalling 4.24
  remote control 6.44
  Signalling 4.62
  VMSinad (remote control) 6.49
RX Tests – AF Analyzer (control)
  remote control 6.45, 6.50
RX Tests – Hum & Noise (control)
  remote control 6.53
RX Tests (control)
  Non Signalling 4.30
  remote control 6.44, 6.49, 6.52, 6.57
RX Tests Configuration
  Non Signalling 4.29
  remote control 6.45, 6.53, 6.58

S

SAT
  Call Established 4.68
  Connection Control 4.42
  remote control (NS) 6.9
SAT Frequency Error 4.9
SAT Peak Deviation 4.9, 6.80, 6.83, 6.84
Scale 4.18
Scale Max 4.17
  RX 6.64
  TX 6.33
Scale Min 4.18
  RX 6.64
  TX 6.33
SCC (SAT color code)
  Call Established 4.69
  Connection Control 4.43
  remote control 6.9, 6.80, 6.83, 6.84
SCPI standard 5.2
Secondary address 5.5
Second-level keyword 5.1
Sensitivity
  definition 4.29
  hotkey 4.26
Sensitivity limit 6.59
Sensitivity measurement (control)
  remote control 6.58
Separate Deviations 6.71
Separate Levels 6.40
Serial Number 4.77
Serial Number Request 6.86
SID 4.76, 6.85
SID 1 4.76
Signal Off 4.51
  softkey 4.55
Signal On 4.51
  softkey 4.54
Signalling 3.1, 3.2, 4.51
  remote control 6.78
Signalling (Alerting) 4.66
Signalling (Registered) 4.64
Signalling (Signal Off) 4.52
Signalling (Signal On) 4.55
Signalling Info 6.90
Signalling Measurements 2.16
Signalling modes 3.1
Signalling Modes 4.76
Signalling states 6.78
  overview 4.52
Signalling tone (ST) 4.43
Single Shot 4.11, 5.3
SN 6.90
Software (enable) 1.2
Special character 5.7
Square brackets 5.7
ST 4.43
  Force ST 4.60
  remote control (NS) 6.10
ST Frequency Error 4.9
ST Peak Deviation 4.9
Standby mode 2.3
Start Level 4.7
Startup menu 1.1, 2.2
Statistics
  remote control 5.3
STATus
  OPERation register 5.5
Status indication 2.7
Status reporting system 5.5
Stepping mode
  AF Analyzer 6.45, 6.50
  Hum & Noise 6.22, 6.53
  Modulation 6.17
  RX Audio Freq. Response 6.63
  TX Audio Freq. Response 6.32
Stop Condition 3.5, 4.11
  AF Analyzer 6.45, 6.50
  Hum & Noise 6.22, 6.53
  Modulation 6.17
  RX Audio Freq. Response 6.63
  TX Audio Freq. Response 6.32
Subarrays
  RX Audio Freq. Response 6.65
  TX Audio Freq. Response 6.34
Supervisory audio tone (SAT) 4.42, 4.68
Symbols (Signalling Mode) 3.2
Synchronization
  remote control (NS) 6.12
System clock 4.46

T

Target Audio Peak Deviation 6.27
Target Deviation 4.8
Target Error Range 4.8, 6.27
Target SINAD 4.26, 6.58
Test Tones
  RX Audio Freq. Response 6.68, 6.69
  TX Audio Freq. Response 6.37, 6.38
Tgt. SINAD Err. Range 4.26, 6.58
Timeouts 4.77, 6.87
Tone Def.
  TX Audio Freq. Response 4.22
Tone Definitions 4.23
Total Freq. Dev. 6.71
Total Level 4.22, 6.40
Total Peak Deviation 4.9
Transmission reserve 4.49
TX Audio Freq. Response

  - Non Signalling 4.16
  - remote control 6.31
  - Signalling 4.61
- TX Audio Freq. Response (control)
  - Non Signalling 4.20, 4.37
  - remote control 6.31, 6.32
- TX Audio Freq. Response Configuration
  - Non Signalling 4.20
  - remote control 6.32
- TX Tests
  - Non Signalling 4.4
  - remote control 6.16
  - Signalling 4.59
- TX Tests – Hum & Noise (control)
  - remote control 6.22
- TX Tests – Modulation (control)
  - remote control 6.17
- TX Tests (control)
  - Non Signalling 4.10
- TX Tests Configuration
  - Non Signalling 4.10
  - remote control 6.17, 6.22, 6.27

U

- Update (software) 1.1
- Upper Limit Line
  - RX Audio Freq. Response 6.66
  - TX Audio Freq. Response 4.21, 6.35
- Upper/lower case characters 5.7

V

- VMAC 4.59, 4.77
  - remote control 6.80, 6.86
  - softkey 4.57
- VMAC / Voice Ch. 4.59
- Voice Ch. Offset 6.4, 6.6
- Voice Channel 6.6, 6.79
  - analyzer 4.39
  - Call Established 4.68
  - generator 4.41
  - Overview 4.58
  - RX Tests 4.26
  - TX Tests 4.6, 4.59
- Voice Channel (VC) 6.82
- Voice Channel (VCH) 4.74

W

- Weighting 4.14
- Wide band power 4.53
  - remote control 6.13

www.manualsplus.com
1025914